

COAL AGE

DECEMBER, 1960

Berwind-White Tools Up . p 80

Operating Guide: Belts . . p 85

Hydraulic Roof Support . p 112

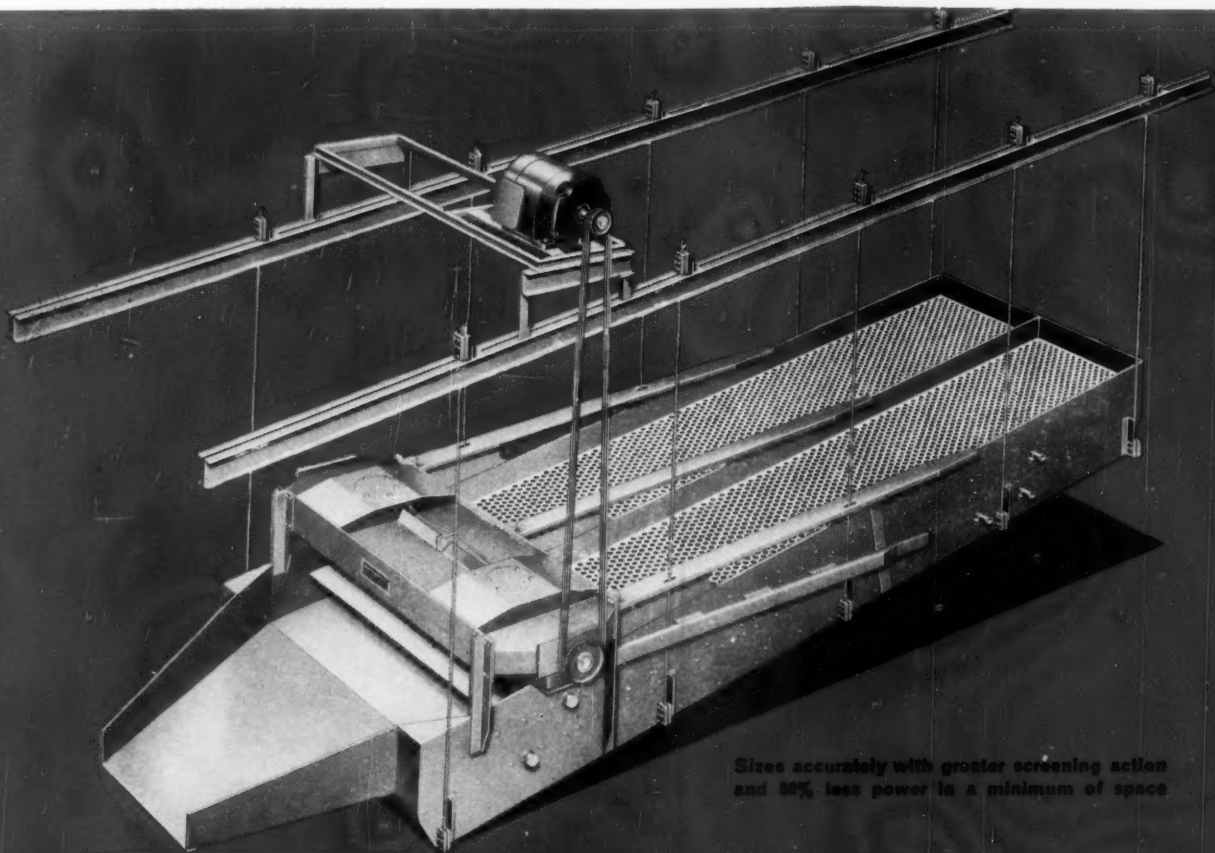
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United Electric's Banner Mine . . . p 70

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Your B.F. Goodrich distributor has full information on the BFG hose described here. And as a factory-trained specialist in rubber products, he can

answer your questions about the many rubber products B.F. Goodrich makes for industry. *B.F. Goodrich Industrial Products Company, Department M-927, Akron 18, Ohio.*





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Comin' down the mountain

Twenty degree grades — hairpin turns — gumbo mud when the weather's bad — a tough test for trucks and drivers — the kind that Macks take in stride. From a mountain-top mine near Van, West Virginia, Bunch Construction Co. had to move coal down to a tippie on the valley floor.

Terrain conditions made conveyors out of the question, so they cut a road-way up the face of the mountain and put a fleet of big Mack L Models on the job.

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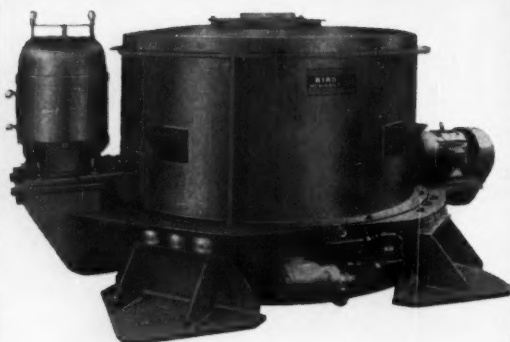
Loading at mountain-top mine. Big L Model Macks take on 30 tons at a time from high-speed conveyors and are on their way again in minutes.



Another thirty tons of coal arrive safely at the dump site. On tough jobs the world over, Mack dumpers prove they are built to handle every assignment with little or no downtime and only routine servicing.



How to do Your Fine Coal Dewatering **BETTER AND AT LOWER COST**



On stoker size coal

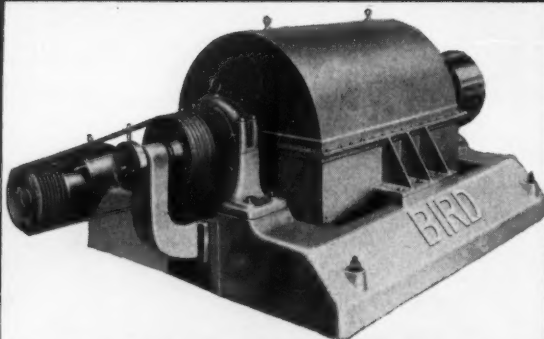
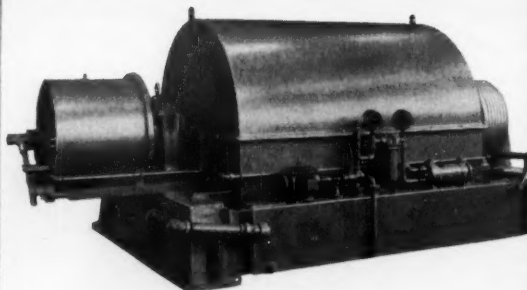
— the BIRD-HUMBOLDT OSCILLATING SCREEN CENTRIFUGE delivers it so dry it won't freeze, and with no appreciable degradation. Screens last for thousands of hours.

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This Month in DECEMBER, 1960

COAL AGE

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► Stripping, Preparation

Banner Mine: United Electric's 4,000-Tpd On-River Producer of Illinois Coal p 70

Development of Banner mine is the result of positive evaluation of a coal bed previously thought to be marginal or too difficult to mine at a profit. The new operation on the Illinois River taps an 18-million-ton

reserve. The stripping ratio is 18:1, but superior quality of the coal offsets some of this disadvantage. Coal is transported on belt conveyors to river-loading docks for shipment to market, after upgrading in a modern preparation plant. Cleaning equipment includes Dutch State Mines heavy-medium vessel.

Engineering Highlight—Well-planned drainage measures are a must in mining coal 30 ft below adjacent river bed.

► Continuous Mining

Berwind-White Tools Up, Hits Production

Peaks p 80

Coincident with the introduction of continuous mining at Eureka No. 40 Upper mine intensive training of foremen and crews and intensive industrial-engineering studies were undertaken. These steps were essential to develop the full potential of new and improved equipment. Important in the productivity increases at the mine was the development of a belt feeder by the coal company to receive fast-rate discharge from shuttle cars and meter this coal to 30-in belt conveyors. In a period of 2 yr productivity has improved from an average of 212 tons per unit shift to 428 tons per unit shift, or close to 20 tons per man on the payroll.

Record—One unit shift produced 877 tons with an average shuttle-car haul in excess of 300 ft. Crew worked 420 face minutes with no mechanical failures.

► Mine Safety

An Analysis of the Causes

Of Mine Fires and Ignitions p 83

H. F. Weaver, Chief, Div. of Coal-Mine Inspection, U. S. Bureau of Mines, Washington, D. C.

Statistical breakdown of causes of ignitions and fires reported to the Bureau show improvement in the record since 1952—and a need for increased effort to continue the progress. Of the 209 ignitions reported in the past 8 yr 74 resulted from electrical causes, 37 from explosives, 41 from sparks from cutting bits, 35 from

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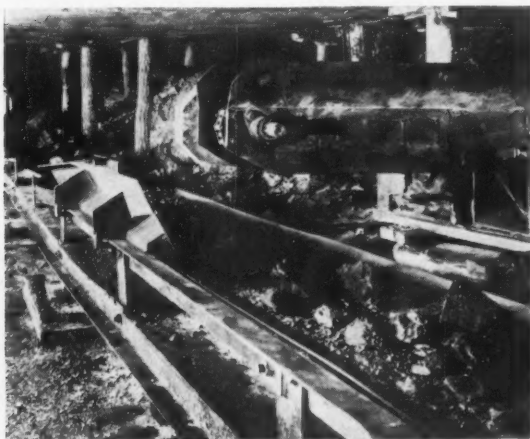
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This Month in Coal Age—Cont'd

open flames or smoking, eight from flame safety lamps, four from mine fires, one from lightning and nine from undetermined causes.

Addenda—The Bureau's research efforts to find preventives against ignitions and better materials for fighting fires.



► Operating Guide

Belt Conveyors and Belting p 85

Fourth in the series of *Coal Age* Operating Guides is a 16-p section on current practice and ideas in the transportation of coal on belt conveyors. Types and applications of conveyor structures are analyzed and explained. Feeding arrangements are emphasized in explaining the transfer of coal from shuttle cars to belt conveyors. Types of belting are described with regard to construction and applications. Special attention is devoted to splicing and the maintenance of conveyor lines. Added features are a tabular Troubleshooter's Guide and a review of safety with belt conveyors.

Special—Buyer's Guide for aid in purchasing belting and conveyor materials.

► Maintenance Ideas

Good Commutation:

Better Motor Performance p 104

Maintaining good commutation is one of the most important electrical factors of DC machines. Manufacturers produce machines which are designed to provide good commutation. The problem is to see that they remain that way. To do this maintenance men must know what factors are required to produce good commutation. Articles which have appeared in *Westinghouse Maintenance News* cover the subject well. Three of these articles are presented here to give you a better understanding of commutation.

Photo Know-How—Photos illustrate important points that are necessary for good commutation.

This Month in **COAL**

2% FOR BITUMINOUS—December might provide a surprise in bituminous output but it is not likely. Therefore the conclusion is that the gains for 1960 have already been made. These gains aggregated approximately 8 million tons to the end of November. So, if December 1960, should prove the same as December, 1959, the gain for 1960 will be around 2%. Considering the trend in steel, this might be considered a major achievement for coal.

What about 1961? The consensus is that there will be no major increase in business pace in the first 6 mo. On this basis, bituminous will go along at about the same pace at least for a while.

OFF AGAIN FOR ANTHRACITE—Looking at anthracite today it is difficult to believe that it has in the past attained a production peak of 100,000,000 tons. This year it is taking another licking to the tune of 2½ million tons, and if the same thing occurs in 1961 it will be down to 15 million, thus validating the prophetic powers of some pessimists of long standing. Price limits industrial possibilities, except in the region itself, and increased convenience and automatic operation swings the preference to oil and gas in the heating field. Chemical, gas and other possibilities remain long shots—at least at this time. Byproducts of the continued anthracite shrinkage include such diverse developments as cessation of pumping, cessation of mining and further consolidation of ownership.

EXPORTS FIRM—The year so far has proved to be better than some originally expected in overseas exports. They are slightly under 1959. Therefore the overall picture is one of stability for the moment and possible improvement in the future. German representatives visiting in the U.S. in late October and early November feel that that country may up its takings, and in Canada the Rand commission has made quite a case for buying substantial tonnages in the U.S. Perhaps, therefore, cautious optimism may well be warranted.

PIPE AND RAIL—On the surface, at least, activity possibly leading to another coal pipeline is only nominal at the present time. The major reason is the course of rail rates. If the railroads continue to really try to hold the business by getting the rates down, the pressure for additional lines is expected to remain low. But interest has grown rather than subsided, and the ranks of those who are casting their eyes on coal-line possibilities have recently been swelled by another gas-line corporation.

MORE RECRUITS—Utilities and steel have recently provided even more evidence of the solidity of coal in those industries. In the Middle West, a new 10-yr contract received by one coal organization calls for a total of 13,000,000 tons. In the Far West, a coastal steel concern has bought a 35-million-ton reserve of Utah metallurgical coal. And in the East the question of finding uncommitted reserves sufficient for power plants that might be planned 25 to 30 yr from now is beginning to agitate at least some heavy consumers of electricity, such as, the aluminum industry.



Giant Lima 2400 dragline equipped with 7-yd. bucket moves an estimated 3000 yd. in 9-hr. shift.

7-yd. LIMA dragline works 19 hours daily; maintenance less than \$50 in 2 years!

"The Lima 2400 dragline is the best equipment buy we've ever made. It recovers about 500 tons of coal a day, working a 10- and a 9-hour shift. Yet maintenance costs in 2 years have amounted to less than \$50."

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"I checked before I bought the Lima—for my money, Limas are bigger, heavier and better built than comparable rigs of other makes. From wide, heavy duty brake and clutch bands to shock-reducing torque converter, the 2400 is designed to outwear, outlast and outstrip other machines on the market.

"I was impressed by the field service that the factory engineers provided in adjusting the new machine for me. They also saw to it that my operators were thoroughly familiar with the 2400. Both parts and service from fac-

tory and distributor are excellent. We also have a Lima Type 34 Paymaster. Both Limas have proven to be high performance, low maintenance machines." *From a report by the Harold A. Siegel Coal Company, Clarion, Pa.*

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► Longwall Roof Control

Hydraulic Roof Control p 112

E. H. Jefferies, Mining Engineer, Dowty Mining Equipment, Ltd., Ashchurch, Glous., England.

Power-operated roof-support frames are increasing productivity in British coal mines. The quick-setting, high-load jacks permit longwall mechanization to proceed with fast loading machines and with quick support of newly exposed roof. An improvement on these single power-operated jacks is the coordinated, self-advancing roof support system, consisting of a series of hydraulically operated frames. The effect is to reduce the size of crew required. Rapid development techniques in U. S. mines would make it possible to consider the application of the system in retreat longwall operations.

Plans—How the system may be applied.

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This Month in Mining Practice

'60 PRODUCTIVITY—It can be assumed that the gains in tons per man in the bituminous industry in 1960 will be equal to those racked up in 1959, which attained an average of 12.22 tons, an increase of 0.89 tons over the 1958 figure of 11.33 tons. On this basis, the average for 1960 will be over 13 tons per man. Big reasons? An increase in stripping percentage and productivity, more continuous miners plus increased skill in their operation, and more weeding out of mines with less-favorable conditions. Since the possibilities are far from exhausted the year 1961 will be marked by a further productivity increase—perhaps as much as 1960 or more.

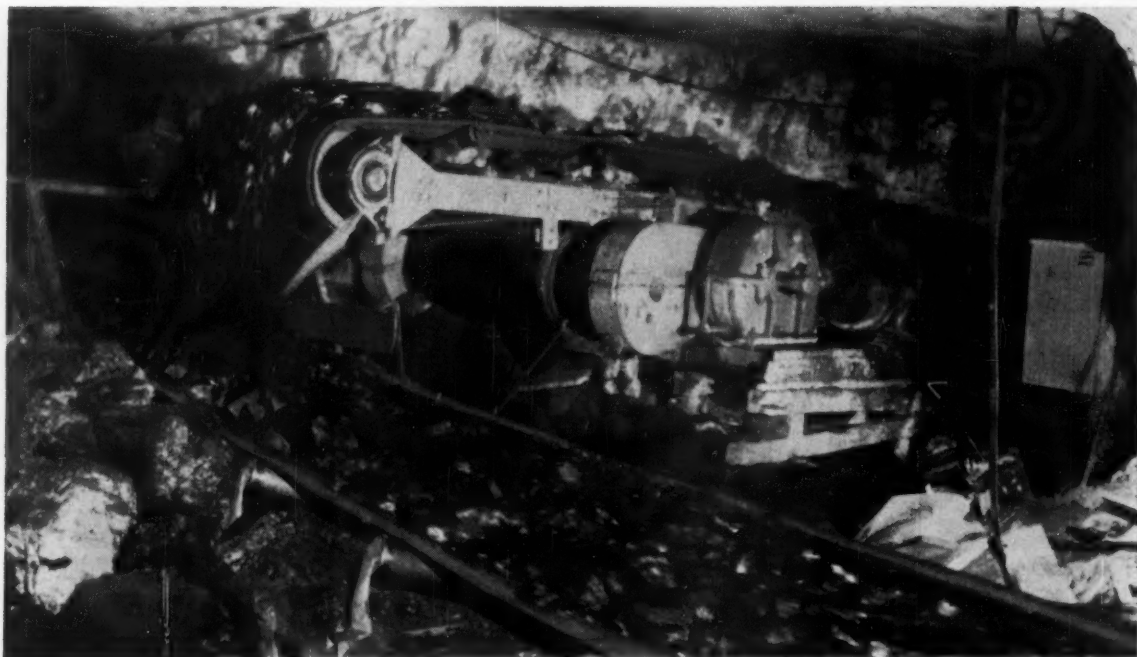
RADIATOR PROTECTION—Permanent antifreezes have been available for quite a few years but they have been "permanent" for only one season as far as the manufacturers have been concerned. This year, the manufacturers offer new products which they claim to be truly permanent. Trucks and tractors are of course prime possibilities, and some fleets already have been serviced with the new fluids. Preliminary reports indicate good results with worthwhile savings.

GIANT FILTER—The latest champion in mining equipment size and capacity is in the preparation division—a 12½-ft-diameter 14-disk filter with an equivalent operating area of 3,750 sq ft. It will handle fine refuse at a rate of 75 to 100 tph, and is the latest of the supercapacity units that are finding increasing application in the supercapacity preparation plants that likewise are showing up in growing numbers. The fact that filters and other equipment for handling fine coal, refuse and water are growing in size and capacity is further evidence of the stress being laid by coal companies on reclaiming all the coal possible and eliminating stream-pollution possibilities.

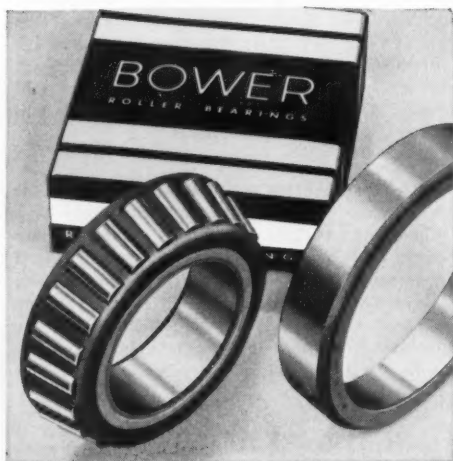
VISIBLE WARNING—From manufacturing comes some thoughts on using fluorescent paints. The major objective is calling attention to hazards. Another is making certain objects or areas more visible. It might be assumed that if a little is good a lot would be better. The manufacturing experience indicates, however, that fluorescent painting also can be overdone and thus lose its effectiveness. The secret is employing it where it is really helpful and refraining where it might lead to a feeling that it didn't mean too much.

LOW MACHINES—News of additional designs and more concentration on present designs of continuous miners and other equipment for thin coal are further assurance that the low-coal miner will have tools comparable with those available to thick-coal operators from the standpoints of capacity and reliability. The problems are not easy, but certain prototypes are showing that they can get results. In the relatively near future, therefore, the low-coal operator should have a choice—small for the present, but still a choice—among several good miners.

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The design of Spher-O-Honed tapered roller bearings insures better lubrication, smoother surface for less friction under load and longer life. Another important reason for making all replacements from the Bower line is *availability second to none* in all sizes you need. Contact your bearing specialist whenever replacements are due. He's always nearby to help with the right sizes and types for the job.

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The Coal Commentator

Competition Ahead?

Will the conveyor and rail haulage hold their lead in mine transportation in the future? They are established and have proved that they can do the job economically. But there are other means that could be used. The wet pipeline, for one, was experimented with in a Virginia mine a few years but was dropped because of degradation. Hoisting by pumping was developed in metal mining and is still the subject of experimentation in various countries. And the Germans, among others, have worked on pneumatic hoisting—a method now being looked at by U.S. people to see if some major research is warranted here. If hoisting can be done it is logical that air can move coal horizontally, and therefore this must also be considered a possibility.

But the conveyor and rail, to repeat, are established, proven and economical. This is not to say that work on alternatives, including those listed above, is not worth services consideration. So, coal probably will be handled at mines by the familiar methods and equipment for some time, but they might have one or more competitors some time in the future.

The Tax Job

Your commentator, he is sure, is not alone in experiencing the pains of paying taxes, but hardened though he is he couldn't help wincing at reading recently that the average state tax—not federal, but state—was \$100 for every man, woman and child in the U.S. in the year ended last June 30. Reaction? It's a lot of dough anyway you look at it and highlights the growing impact of all taxes on the American pocketbook. The situation is even worse when one contemplates the future.

Maybe we want the services these taxes are supposed to pay for. If so, then we should be content. If not, the job is to make it clear that we don't want government to take over and do what we are prepared to do ourselves, or do something we don't want at all.

Inside Track

As one studies the fuels picture around the world, a pattern begins to emerge—and it is the pattern of developments in the U.S. in almost all instances. For a case in point, take Russia, now top dog in production as a result of its drive to industrialize, immediately involving, in turn, increased steel and manufacturing capacity. Coal was a necessity, and being plentiful and cheap Russia began to draw heavily on it, and for a time expected output to continue to rise indefinitely. Now, it expects the peak to come in 1965 or 66 for the same reason as

in the U.S.: increased use of oil and natural gas. China also has joined the club with 383 million tons in 1959.

The upshot? As in the U.S., coal probably will eventually find its chief application as a source of coke, as fuel for electric utilities, and for power, process steam and heat for industry. These are the big needs everywhere there is heavy industrialization, and where there are good supplies of coal at reasonable price, it will have the inside track for these and other needs, with oil and natural gas serving transportation and other specialty needs.

Oil Too

It may turn out that a long-held belief that oil production, refining and distribution was one of the most efficient of all systems was not such but something else entirely. This observation is prompted by the fact that one major U. S. company has cut its force, management and workers, some 25% in past 5 yr, and is now doing more business than before. Other companies also are said to have made substantial savings in manpower.

Though coal does not try to claim a monopoly in upping production per man it has been a major practitioner of the art, and has not been inclined to give oil much credit for such work. If oil companies can keep up the process it is possible for them to augment their competitive power to at least some extent—perhaps not so much against coal as against the energy source that is causing it a real headache—natural gas.

But oil's potential in labor-saving is limited. Coal's is still good. Conclusion? Coal is not likely to have its competitive power reduced by anything oil—or natural gas—can do labor-wise.

Most Rewarding

Who knows it all—about coal mining or anything else? The answer is, "Nobody," but a fair number of folks come pretty close to it. They amass information in all conceivable ways, and particularly by reading, though reading is by no means the only important method. Precise measurement of the value of reading is impossible but one thing is sure: without it it would be impossible to reach the same level of knowledge and still get anything else done.

So the moral of this little homily is: Don't scrimp on your reading. Make it a definite part of your business life, and learn to be as efficient about it as about all your other activities. See, for example, "How to Cut Your Reading Time" in the October issue, p 76. And don't forget (plug) that your most rewarding business reading is in *Coal Age*, month after month and year after year.

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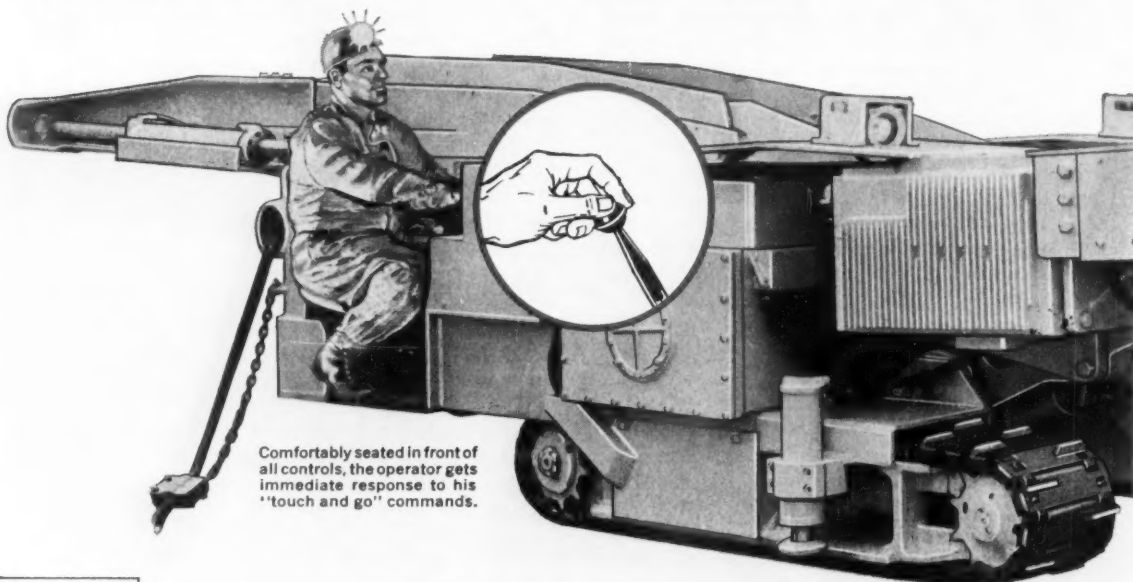


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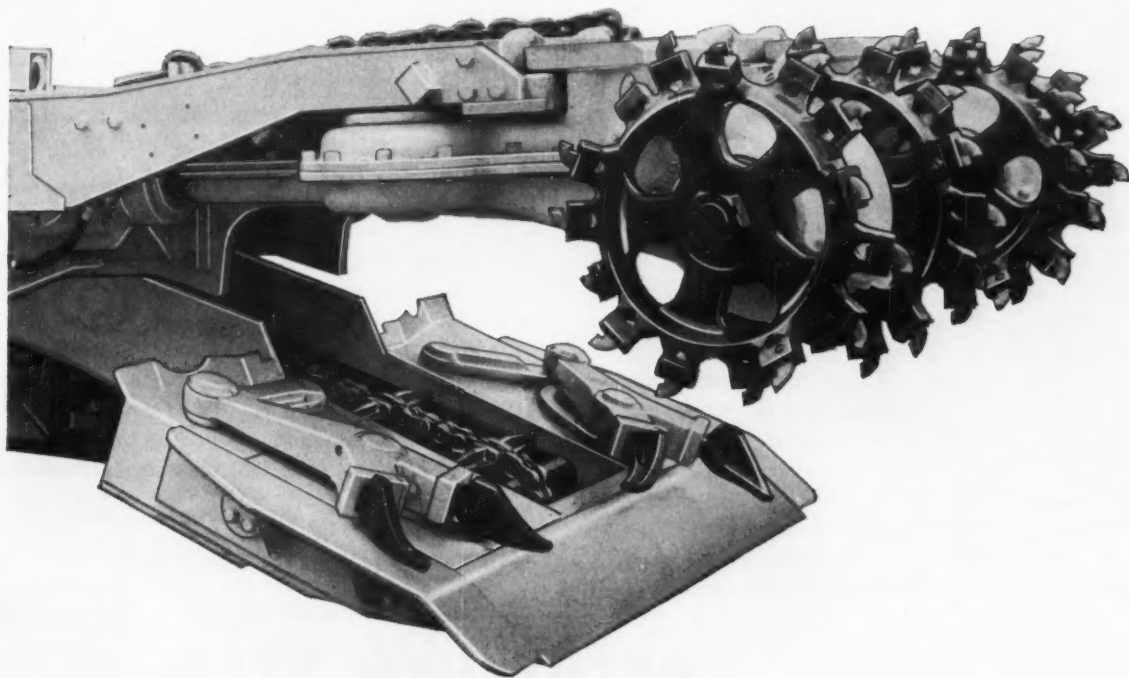
1. CONTROLLABLE CUTTING HEIGHTS

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3. TRAMS LOW—CUTS HIGH

The powerful, spinning, oscillating cutters respond instantly to the operator's command to follow and cut the seam's varying heights.

The Miner quickly mills out space for a loading station . . . provides greater working area—all by "touch and go" control.





What's the best way to anchor a frog?

That's an easy one to answer: use Bethlehem Hook-Twin Tie Plates. Here's why they do such a superior job:

First, the hooks on these tie plates are larger and stronger than any spike head; thus they keep a tighter grip on the rail base than track spikes ever could.

Next, being an integral part of the plate itself, Hook-Twin Tie Plates distribute track motion over a broad area of the tie, and remove direct pull from the spikes which anchor the plate. This helps check both vertical and lateral thrust.

Because these plates are used in pairs (two plates fit neatly on a tie), they can easily be adapted to any

frog position or angle. And they elevate the frog to keep it flush with the running rail. They are also handy to use under guard rails and at approaches to switches.

Hook-Twin Tie Plates are available in several lengths. They are low in cost, yet they offer a healthy return in safety and trouble-free operation. A Bethlehem mine-track engineer will be glad to go over the full story with you. You can reach him through the nearest Bethlehem office.

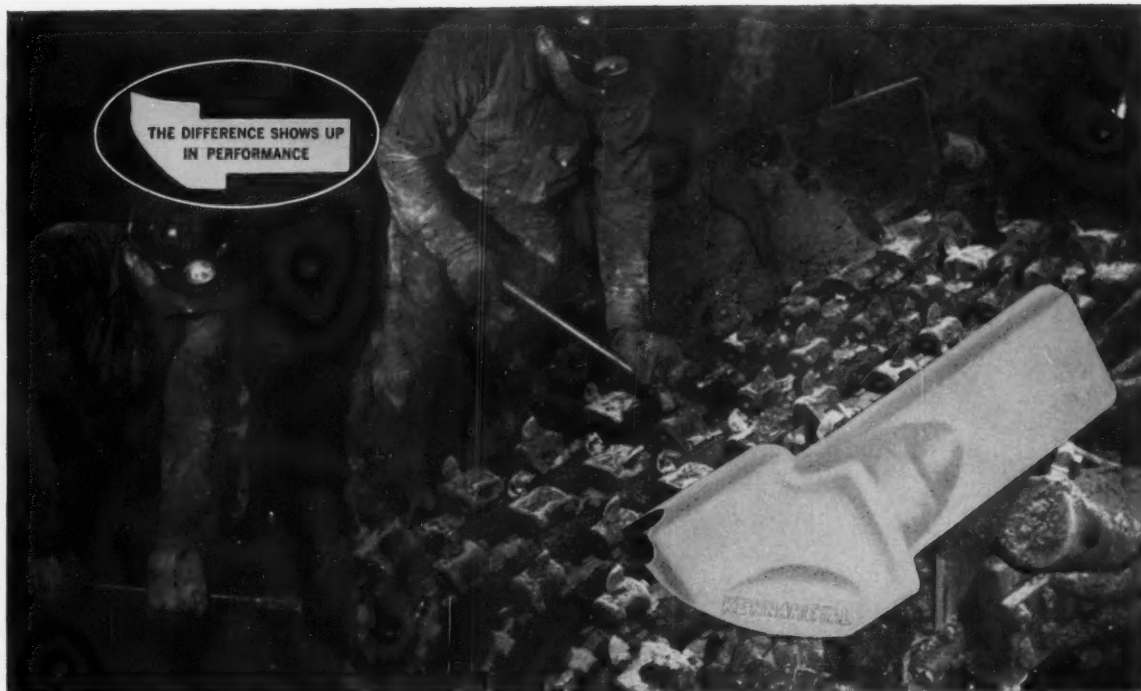
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Sales:

Bethlehem Steel Export Corporation

BETHLEHEM STEEL





Rugged Kennametal U3RA Cutter Bits installed in new type chains on a 1 JCM continuous miner. Close-up shows the strong shank design.

How do YOU compare bits?

On the basis of . . . Bit life • Tonnage • Bit cost per ton?

KENNAMETAL BITS EXCEL ON ALL THREE COUNTS

At this West Virginia mine, bit costs averaged 5½ cents a ton, using standard carbide bits. Irregular occurrence of sulphur lenses and balls in the Pittsburgh No. 8 Seam sometimes jumped the average to 9 cents, with some sections running up to 67 cents. Tip failures occurred more often than in normal cutting, but breakage of the ½" x 1" shank was the big problem.

Switching to lower cost steel bits with hardfaced tips lowered bit costs considerably. But it also lowered production.

Kennametal U3RA Bits not only reduced shank breakage, but tip failures as well. The average bit cost dropped from 9 to 7 cents a ton . . . and production in heavy sulphur sections more than doubled.

You can't pick good bits by appearance or price tags. Let the Kennametal difference show up in performance at your mine. Your Kennametal Representative will help you select and actually test Kennametal Bits in your mine. Call him, or contact us direct. KENNAMETAL Inc., Mining Tool Division, Bedford, Pa. 97257

- Consistently high quality keeps Kennametal bits in service longer . . . resulting in fewer bit changes and more operating time at the face.

- Free-cutting design of Kennametal bits draws less power, permits faster cutting, maximum production, less maintenance.

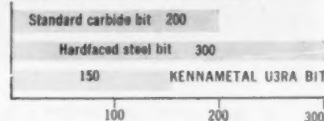
- Every Kennametal bit is backed by 21 years of leadership in tungsten carbide tooling, including the development of the first carbide cutter bits for the American mining industry.

- Nineteen full-time Kennametal Representatives and the Kennametal Distributors—leading mine supply companies, provide assistance in solving your cutting and drilling problems and supply the tools you need . . . when you need them.

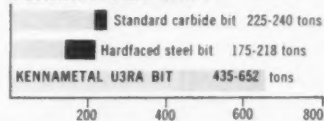
THE DIFFERENCE SHOWS UP IN PERFORMANCE

Different bits—same section—heavy sulphur

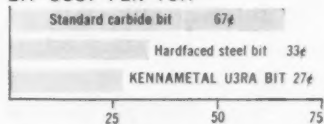
BITS CHANGED PER SHIFT



TONNAGE PER SHIFT



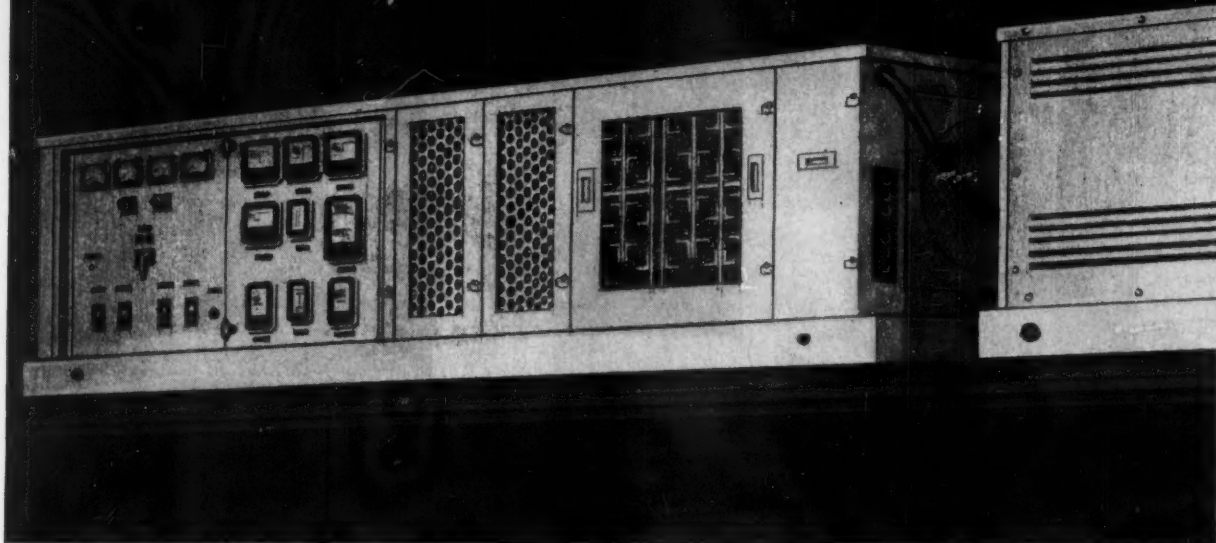
BIT COST PER TON



INDUSTRY AND
KENNAMETAL
...Partners in Progress



The facts speak
for themselves...



WESTINGHOUSE PORTABLE

as d-c power supplies

- cost less than

Ignitron rectifiers

- are more efficient

- are far shorter • need
far less maintenance

Early in 1957, Westinghouse proposed the first commercial use of silicon rectifiers for d-c conversion in mining.

Like the rest of the electrical industry at that time, Westinghouse was firmly committed to the Ignitron system. But intensive investigation had proved to us that silicon's superiorities could no longer be overlooked. Silicon provides a lower cost, more efficient and more compact rectifier, one that is more reliable—silicon cells don't age, so there's nothing to wear out. One that requires less maintenance



SILICON RECTIFIERS

—there are no complex excitation circuits, no vacuum tubes, no water cooling necessary.

Since 1957, Westinghouse has built a number of portable silicon rectifiers in ratings up to and including 750 kw. We shall be glad to send you the names of Westinghouse Silicon Rectifier users near you so you may ask them about their experience and opinions. For complete facts, call your Westinghouse representative, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. You can be sure . . . if it's Westinghouse.

J-15020

Westinghouse





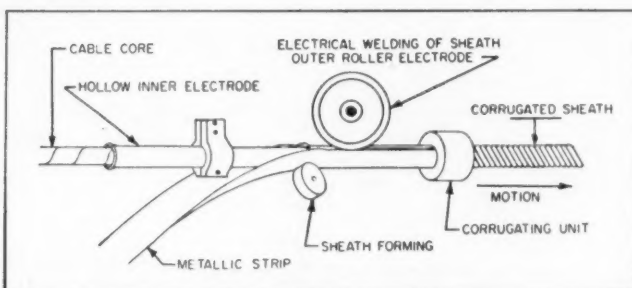
Only C-L-X[®] Continuous Lightweight eXterior by Simplex

■ What C-L-X Is

Simplex C-L-X is a packaged combination of cable and a pliable, corrugated metal sheath that's impervious to liquids and gases. It requires no separate duct or conduit regardless of environment. It is available with sheaths of steel, copper, or aluminum with or without plastic jacketing.

C-L-X is manufactured by a unique, continuous process as shown in the sketch below.

C-L-X has the imperviousness of lead, the strength of conduit, and the pliability of a non-sheathed cable. No other system compares with C-L-X.



■ What C-L-X Does *Cuts Installation Costs*

A Southeastern utility company needed a second feeder when the load capability of one of its substations was doubled.

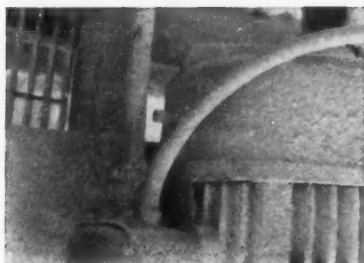
For reasons of economy they wanted a cable which would be used in a single length for both underground and aerial use. 3-conductor 500 MCM polyethylene-insulated, shielded 15KV C-L-X with polyethylene jacket was selected.

The route for the installation called for about 240 feet directly buried in the substation property with four 90-degree bends and one 45-degree bend from pothead to riser pole. The corrugated metallic sheath offered both mechanical protection and the necessary pliability for installation. A 705-foot aerial section called for a 5-degree sweep and a 30-degree bend near the pothead on the field end of the cable.

C-L-X was installed as a single length for both buried and aerial sections. The buried section was laid in a 3-foot deep trench with a 3-inch layer of sand above and below the cable.

A utility engineer states "only 2½ days were required for the installation of the cable, exclusive of splicing." A saving of more than \$20,000.00 was realized by using C-L-X instead of a complete underground duct system. The carrying charges saved by this plan will pay for the present feeder in about three years.

Sealed Cable Systems Can do so many Jobs So Well



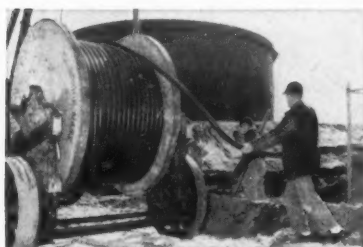
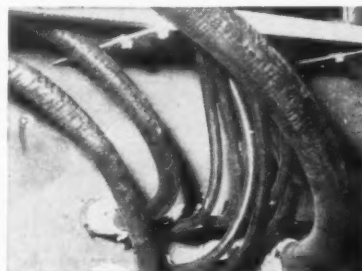
Resists Chemical Attack

This company had a corrosion problem with the electrical system in its calcium chloride reclamation building. Due to the highly corrosive atmosphere of the building, conduit life was only 6 to 9 months. The conduit was replaced with a C-L-X cable system. Now, after two years of operation, the C-L-X system is still performing perfectly, shows no signs of deterioration.

Offers Unique Pliability

An oil refining plant was faced with an unusually difficult wiring installation involving both power and control.

After examining every usable cable, refinery engineers selected C-L-X because it met the following requirements: (1) C-L-X could be made explosion-proof with the use of proper terminators. (2) C-L-X could be made in a continuous run for the lengths required, regardless of diameter. (3) The bending radii of C-L-X cables were sufficiently small to allow them to snake through a jungle of existing pipes.



Protects Against Liquids and Gases

An East Coast petroleum tank farm needed power and control wiring from a control panel to a series of motors used to circulate high octane fuel. Since an underground installation was desired, and the ground was saturated with oil, gas and water, it was imperative that the cable be completely liquid-tight and gas-tight.

A C-L-X 8-conductor cable protected with PVC solved the problem perfectly. In addition, installation cost was far lower than that of unprotected cables pulled into conduit.

What C-L-X Can Do for You

Whenever you're faced with a difficult installation of power, communications or control cables — or combinations — remember this important fact: *Only Simplex C-L-X cable systems offer you all of these advantages...Exceptional Strength...Unequalled Pliability...Protection from Liquids and Gases...Faster Installation.*

*Send for Illustrated Brochure
Containing Application and Engineering Data*

SIMPLEX
WIRE & CABLE CO
Cambridge, Massachusetts

SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge, Massachusetts

☐ Please send me a copy of your Simplex C-L-X brochure.

NAME

TITLE

COMPANY

☐ Please have representative call.

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NEW R/M "COALMOVER"



**Hauls More
Lasts Longer
Costs Less**

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with any other Conveyor Belt on the Market

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- Exclusive R/M Flexibility Over Reverse Bend & Snub Pulleys
- Natural Training, Easy Troughing, Full Loads in Low Headroom
- Maximum Resistance to Rips, Gouging and Abrasion, Impact
- Requires Minimum Take-up Adjustment—Low Stretch
- Will Not Stiffen at Low Temperature—Not Thermoplastic
- Designated "Fire Resistant, U.S.B.M. No. 28-10"

Meet the new standard for performance in your mining operations. Let an R/M representative demonstrate the advantages you get only with new R/M "Coalmover" Conveyor Belt.

RM 1025

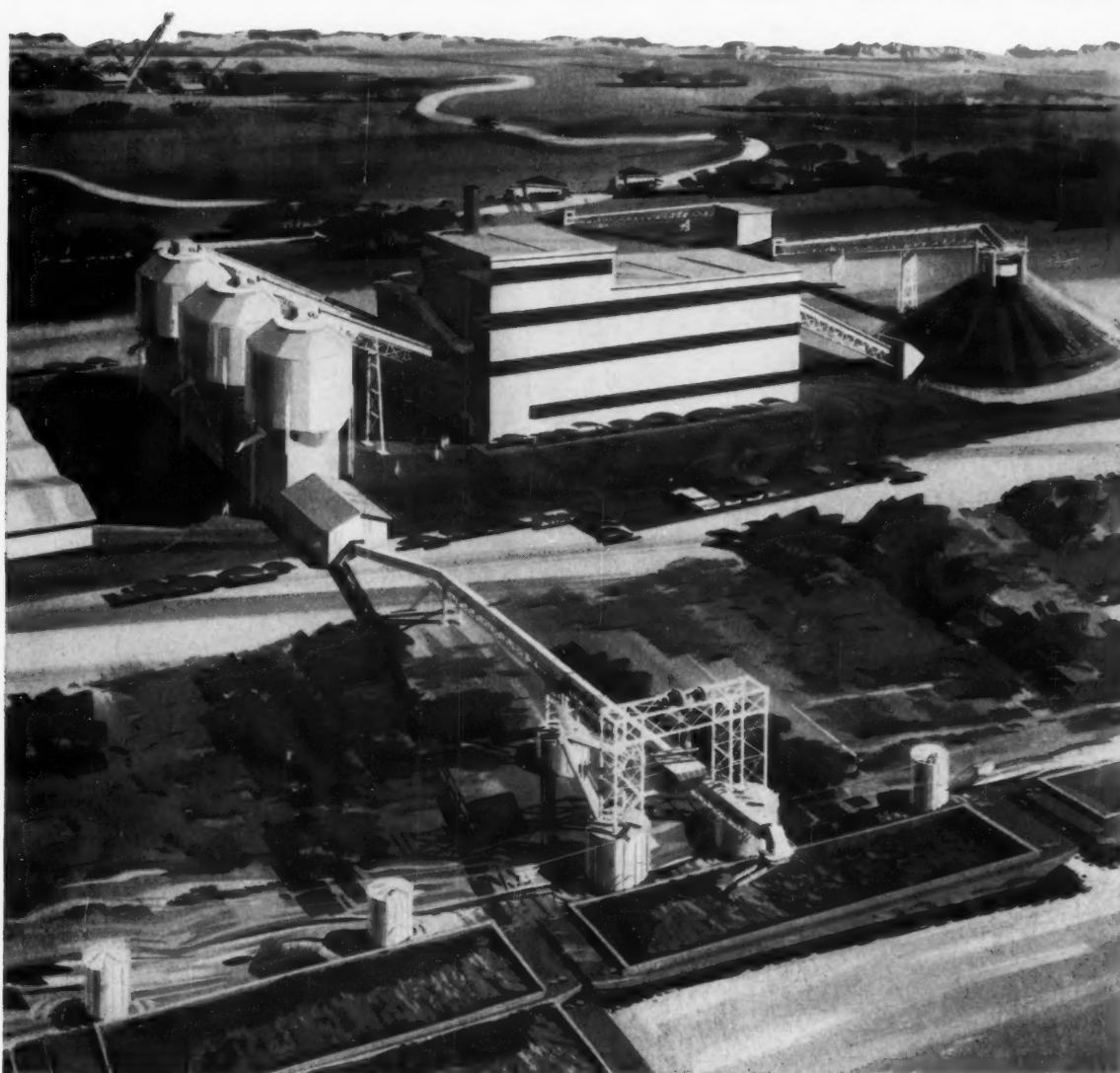
RAYBESTOS-MANHATTAN, INC.
MANHATTAN RUBBER DIVISION, PASSAIC, NEW JERSEY



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RUBBER
PRODUCTS
... MORE USE
PER DOLLAR

**The United Electric Coal Companies
new modern direct barge-loading coal mine**

BANNER MINE



*Preparation Plant and Coal Handling Facilities were
Designed, Engineered and Built by Roberts & Schaefer*



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*Schaefer
Company*

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the exact car to match
your seam conditions

With five* basic lines of modern shuttle cars, including AC, DC and diesel-driven cars, your Joy representative can assist you in selecting the *exact* machine to give you maximum production under your mining conditions. Machine heights range from the new 6-wheeled 18SC-7 at 24" high to the large capacity 15SC-1 measuring 57½" high. And every car has Joy's more than 24 years of shuttle car experience built into it. Have your Joy representative discuss the proper car for your application.

*Plus a complete line of special diesel and electric-driven shuttle cars for hard rock applications.

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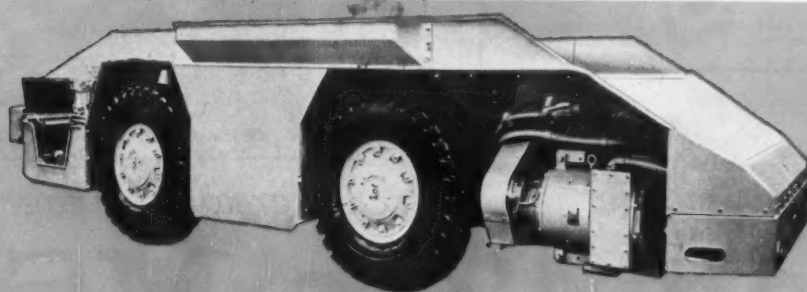
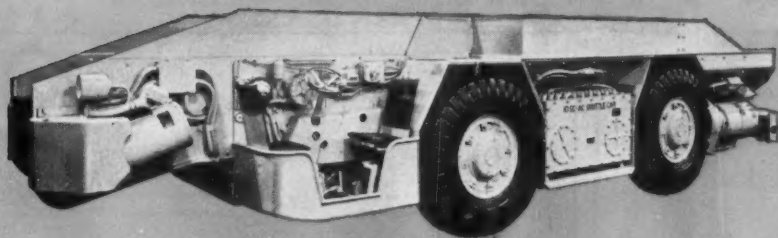
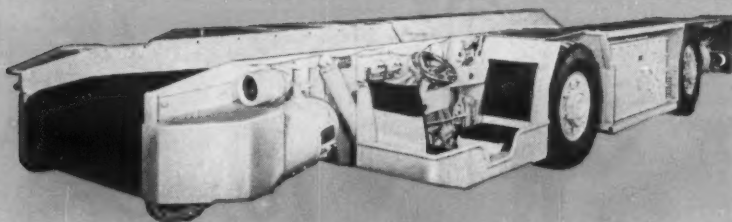
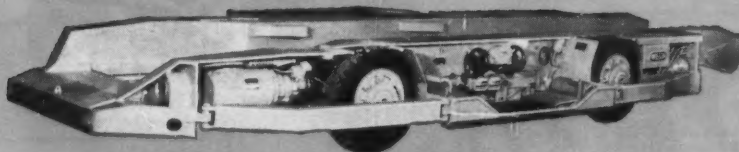
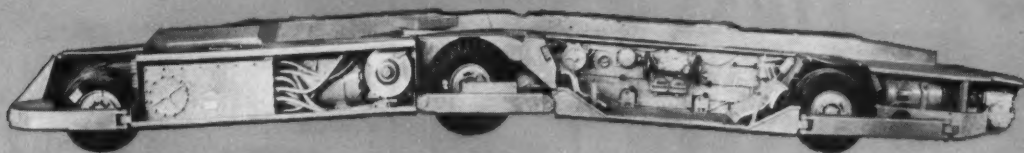
18SC-7 Only 24" high for seams as low as 30". The new 6-wheel design uses two center wheels for traction and the four corner wheels for steering. The load is spread over six wheels, giving the car amazing capacity and mobility. Capacity: 125 cu. ft. without sideboards. Other models of the 6-wheeled 18SC are available in heights of 27" to 40" and capacities up to 400 cu. ft.

8-SC A conventional four-wheeled car for low seams. The machine is only 26¾" high, yet has 5¼" of ground clearance for fast haulage over rough bottom. Carries a two ton payload. Available in 44" and 56" conveyor widths.

16SC-4 An extremely rugged car designed for heavy loads and steep grades in medium-low coal. With basic height of 33", has 130 cu. ft. capacity without sideboards. Two other models of the 16SC, one just 30½" high, have the same extra heavy wheel-drive units.

10SC-13 This 43" high unit is designed for high tonnage and difficult conditions in medium seams. Will tram fully loaded up a 15% grade. Five other models of the 10SC are available with heights ranging from 43" to 49", capacities up to 10 tons.

15SC-1 A true high tonnage car that hauls 15 tons in one load, the 15SC is specifically designed to make the most of high seam "high-ball" operations. The machine measures 57" high. Two 10 hp conveyor motors permit unloading at conveyor speeds suitable for belt or mine car haulage.



**WORLD'S LARGEST MANUFACTURER OF
UNDERGROUND MINING MACHINERY**

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M-S-A® Footwear
Bulletin No. 1303-3A



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M-S-A® Permissible Electric Trip Lamp
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Mine Lighting System
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Equipment—Bulletin No. 1600



M-S-A® MinePhone®
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M-S-A® Mine Rescue Communication System
Bulletin No. 1608-1

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M-S-A® PNEOLATOR®
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M-S-A® H-H Inhalator
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FIRE FIGHTING

M-S-A® Model 2100
Mine Fire Truck
Bulletin No. 1203-3



M-S-A® Model 1000
Mine Fire Truck
Bulletin No. 1203-1



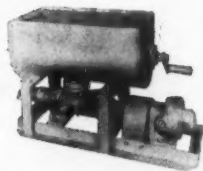
M-S-A® Mine Fire Hose Bulletin No. 1203-2



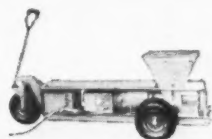
M-S-A® Mine Fire
Control Dry Chemical
Bulletin No. 1208-1

Miners work safest, operators get greater tonnage with
Complete MSA

ROCK DUSTING AND DUST COLLECTING



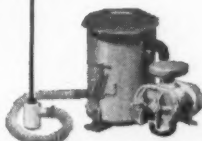
M-S-A® Model 80 Slurry Rock Dust Distributor—Bulletin No. 1201-6



M-S-A® Bantam 400 Rock Dust Distributor Bulletin No. 1201-2



M-S-A® Slurry Rock Dust Distributor Bulletin No. 1201-4



M-S-A® THRU-STEEL® Dust Collector Bulletin No. 1207-1

RESPIRATORY PROTECTION



M-S-A® Self-Rescuer® Bulletin No. EC-1



M-S-A® Dustfoe® 66 Respirator Bulletin No. 1004-3



M-S-A® CHEMOX® Breathing Apparatus Bulletin No. 8-14



M-S-A® McCaa® Two-Hour Breathing Apparatus Bulletin No. 88-3

METHANE DETECTION



M-S-A® Methane Alarm Bulletin No. 0809-2



M-S-A® Methane Recorder Bulletin No. 0706-1



M-S-A® Wolf Junior Flame Safety Lamp Bulletin No. 0807-1



M-S-A® Methane Tester Type M-6 Bulletin No. 0809-3



M-S-A® Methane Detector Type W-8 Bulletin No. 0809-4

FIRST AID EQUIPMENT



M-S-A® Miner's First Aid Cabinet Bulletin No. 0401-2



M-S-A® Jenkins Stretcher Bulletin No. 0408-10

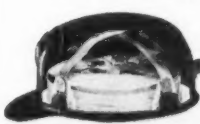


M-S-A® Emergency First Aid Outfit Bulletin No. 0408-10



M-S-A® Unir First Aid Kits Bulletin No. 0401-2

HEAD PROTECTION WITH FIXED-CROWN * SUSPENSION



M-S-A® Comfo Cap® Bulletin No. 0601-3



M-S-A® Type K SKULLGARD® Hat Bulletin No. 0601-4

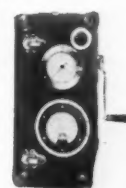
PORTABLE INSTRUMENTS



M-S-A® Portable Oxygen Indicator Bulletin No. 0817-1



M-S-A® Colorimetric CO Tester Bulletin No. 0803-1



M-S-A® Carbon Monoxide Indicator Bulletin No. DS-3

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Product Lines

With these MSA products on the job, men and machines mine more coal safer, thriftier and more efficiently than was ever before possible.

MSA serves mining areas everywhere, with conveniently located warehouses and complete lines of safety equipment. When you have a safety problem, MSA is at your service. Our job is to help you.

Write for illustrated bulletins on any of the above items. They're yours for the asking.

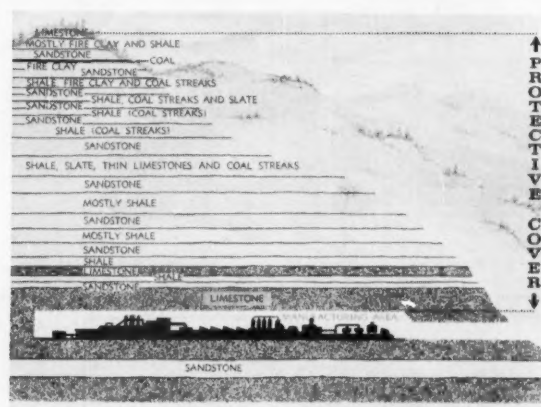


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COAL GASIFICATION through the use of nuclear energy would be accomplished at an underground operation near Morgantown, if Gov. Underwood's recommendation to the Interior Department is accepted.

problem." As he outlined the new breakthrough process, it accomplishes gasification roughly in the following manner: pre-heated helium gas is passed through a nuclear reactor to raise its temperature to around 2,500 F. At this temperature the helium travels to a heat exchanger where it reacts with a pre-heated coal and water mixture, producing gas from the coal. The gas passes out the top of the exchanger, ash and slag out the bottom, and the helium is recirculated by a compressor as the cycle begins again. The gas could be used as a fuel and is a possible raw material source for the production of chemicals and synthetics.

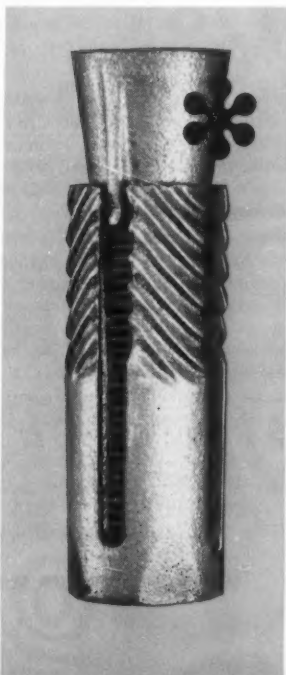
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O-B Designs For Mining Men



RESULT:

A 4-way expansion unit that holds in soft shale or hard rock



4-WAY EXPANSION UNIT BUILDS HOLDING POWER FAST . . . because the flexible fingers of the shell are slightly pre-expanded to grip the wall even before wrenching begins.

GOES UP FAST AND STAYS PUT. When the bolt is shoved up the hole, the expansion unit holds the bolt in place until it's tightened . . . no need to have hands exposed to injury during wrenching.

GREATER STRENGTH IN HARD TOP . . . BETTER "PURCHASE" IN YIELDING TOP . . . because the expansion pressures are spread evenly over the four shell fingers to make the best use of the entire unit's strength. These are the reasons for the O-B Expansion Unit's popularity with mining men. It is easy to understand why more mine roof is supported with O-B Shells and Plugs than with any other kind.

For further information and prices, see your local O-B sales-engineer or write us now. OHIO BRASS COMPANY, MANSFIELD, OHIO. Canadian Ohio Brass Company, Ltd., Niagara Falls, Ontario.

Ohio Brass 
EXPANSION SHELLS AND PLUGS • LINE MATERIALS • SAFETY
AND CONTROL EQUIPMENT • ELECTRIC HAULAGE MATERIALS 

News Roundup (Continued)



COAL RECEIVED OFFICIAL RECOGNITION for its great contribution to the metals industries at the recent 42nd National Metal Exposition & Congress. Set in a prominent place in the "Steel Arena" at Philadelphia's Convention Hall was a brand new 1981 Chevrolet, shown atop a pile of coal, surrounded by component parts and accessories made from steel—and with the use of coal. As an American Iron & Steel Institute spokesman put it, "It's only right that we should pay homage to the great coal industry; without coal almost none of this exhibit would have been possible."

Dump Gas Study Urged

The Dept. of the Interior has called attention to the Federal Power Commission's practice of allowing below-cost sales of natural gas and has called for an immediate government-industry study of the practice. Under-Secretary Elmer F. Bennett said the study should determine "whether the Natural Gas Act, as presently interpreted, is allowing below-cost sales of natural gas which have an adverse impact on producers' prices and sound competitive relationships." He added that "it seems to me that there are conservation factors involved in our limited gas reserves which are not receiving sufficient attention. Legislation may well be in order to attack this problem." The FPC has considered conservation factors in the landmark Consolidated Edison case (see below), and the National Coal Association is supporting the commission in a Supreme Court test.

High Court Act Due—An FPC decision denying, on conservation grounds, natural gas service to the Waterside plant of Consolidated Edison Co., New York, was supported in a joint brief filed Sept. 20 by NCA, Fuels Research Council, Inc., and the United Mine Workers of America. The Circuit Court of Appeals had overruled this decision and remanded the case to the commission but the FPC and coal intervenors gained

a review by the Supreme Court. The case is considered of utmost importance by the coal industry, for the Supreme Court must now determine whether the Natural Gas Act gives FPC authority to control the end-use of natural gas in the interest of conservation by exercise of its certifying power. The court is expected to define the commission's power in this regard and will effect one of the cornerstones on which intervention proceedings are established—control over boiler fuel service.

Also, briefs have been filed in the Northern Natural Gas Co. rate case in the U. S. Court of Appeals for the Third Circuit (Philadelphia). The FPC, after denying coal intervenors the right to participate in the rate proceeding, reconsidered and permitted coal intervention on a "limited basis" with respect to the "rate tilt" proposed by Northern Natural. This action was appealed to the federal court. Because coal participation in rate proceedings is considered to be essential to protect coal industry rights in dealing with problems posed by regulated natural gas pipelines, this case also is regarded as highly significant.

Atomic Power Can Wait

"Fossil Fuels in the Future," an Atomic Energy Commission report show-

ing there is little need for nuclear power plants, at least until the next century, was applauded this week by the coal industry. The report projects energy consumption increasing at a compound annual rate of 4% and draws the conclusion that fossil fuels (coal, oil and natural gas) can meet the world's energy requirements for the remainder of the century without difficulty and with only moderate increases in real costs. Noting that coal and lignite compose more than 71% of U. S. fossil fuel reserves, the report states U. S. solid fuel reserves alone could furnish adequate energy for America for the rest of this century. Reserves of petroleum and natural gas, however, make up only about 6% of the national total. The report says only high-cost production—50 to 300% over 1958 prices—would be available after 1980 and these liquid fuels would be exhausted by 2000 A.D.

West German Coal Tariff Discussed

West Germany's restrictive coal import legislation was the topic of discussion at two meetings of a joint committee of the Coal Exporters' Association of the U. S., Inc., and representatives of the West German coal industry. The German spokesmen said the import quota will probably be increased by the Bonn government after consultation with German consumers, importers and producers. The exporters urged an increase in present quotas and continued their objections to the import tariff of \$4.76 per ton imposed by Germany.

K. U. Brings Suit

Kentucky Utilities Co. has brought suit in Federal Court at Paducah, Ky., accusing the Tennessee Valley Authority of violation of territorial rights restrictions imposed by Congress as regards TVA service to consumers. The suit seeks an injunction to prevent TVA from supplying power to a new chemical coke plant of the New York Mining & Mfg. Co., Calvert City, Ky. Kentucky Utilities contend that location of the proposed new consumer would be beyond the 5-mi limit imposed and TVA would have to build 5.32 mi of power line to reach the location, whereas K. U. has a 69,000-V line within 1.62 mi of the site. It is further contended that if TVA were allowed to provide the service, it would mean a loss of \$60,000 annually to Kentucky Utilities.

*The **GOODMAN** Performance Report*



22850

High Capacity... Easy to Install... Low Maintenance

Goodman ROPEBELT® Conveyor

Here's a conveyor that's practical for use anywhere in your mine . . . development headings, production panels, on main line or slope. Whatever its application, it pays off in high capacity, easy installation, and low maintenance.

Consider capacity. With *full-flex linked idlers* and the downward, as well as inward flexing of wire ropes, Goodman ROPEBELT troughs to whatever load is imposed and moves it without bounce or spill. Shocks are reduced both at loading points and along the line. The result is a dramatic increase in carrying capacity over all other belt conveyors—20% and more—important whether you use ROPEBELT for accepting coal from shuttle cars working behind continuous miners, or for mainlines that carry a mine's total production.

As to easy installation, ROPEBELT is simplicity itself. Component units for intermediate sections (wire ropes, full-flex linked idlers, and supporting stands) are easy to handle and can be set up in a minimum of time. Extensions to keep pace with advance work can be made between shifts. Entire ROPEBELT units can be quickly recovered and reinstalled.

Low maintenance is the result of the same flexibility that increases capacity. Shock to idlers is reduced, thus prolonging their life. Belting lasts longer, and labor cost for clean-up along the line is practically eliminated.

With such features as these, it's easy to see why the Goodman ROPEBELT conveyor is your best buy. We'll be happy to give you full details. It may mean thousands of dollars saved for your company.

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SHUTTLE CARS • LOCOMOTIVES • CONTINUOUS MINERS

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People in Coal



William H. Ritter has retired as president of Reitz Coal Co., Windber, Pa. Mr. Ritter, while relinquishing chief executive duties, will remain as a member of the board of directors and will serve as a consultant to Reitz Coal Co. **Robert H. Seese**, general manager of the Berwind-White Coal Mining Co., which company will take over management of Reitz Coal, succeeds Mr. Ritter as president of Reitz. Also announced was the election of **Thomas J. Willing** as vice president-sales of Berwind-White. Mr. Willing, who joined the company in 1941, replaces **Sidney C. Alden** who is retiring.

John L. Kemmerer Jr. has announced the following promotions in firms he heads: **Theodore E. Burke** has been named resident manager of New York Mining & Mfg. Co., Calvert City, Ky., and coke sales manager of Whitney & Kemmerer, Inc., Dorchester, Va.; **Gerald Green** was appointed superintendent for New York Mining & Mfg. Co., Calvert City; **Robert L. Summitt** was elected general manager of Wise Coal & Coke Co. and New York Mining & Mfg. Co. at Dorchester; and **Herman Selvey** has been named general mine foreman for Wise Coal & Coke Co. at Dorchester.

Paul Bock has resigned as vice president of Simpson Coal & Chemical Corp. and as president of Wyatt-Seanor Coal Co., Cambria-Clearfield Mining Co. and Calloway Land Co.



Clinton C. Cornelius, formerly vice president of engineering, has been elected executive vice president of Emerald Coal & Coke Co., a J. H. Hillman & Sons Co. subsidiary, Pittsburgh, Pa. Mr. Cornelius had been employed by the Pittsburgh Coal Co. and had held positions of assistant chief engineer, general superintendent and vice president of operations with the Baton Coal Co. He had also served as general manager for the United States Fuel Co. at Salt Lake City, Utah.

U. A. Cobb, former superintendent at Kopperston, W. Va. for the Eastern Gas & Fuel Associates, has been named gen-

Safety Director Employed

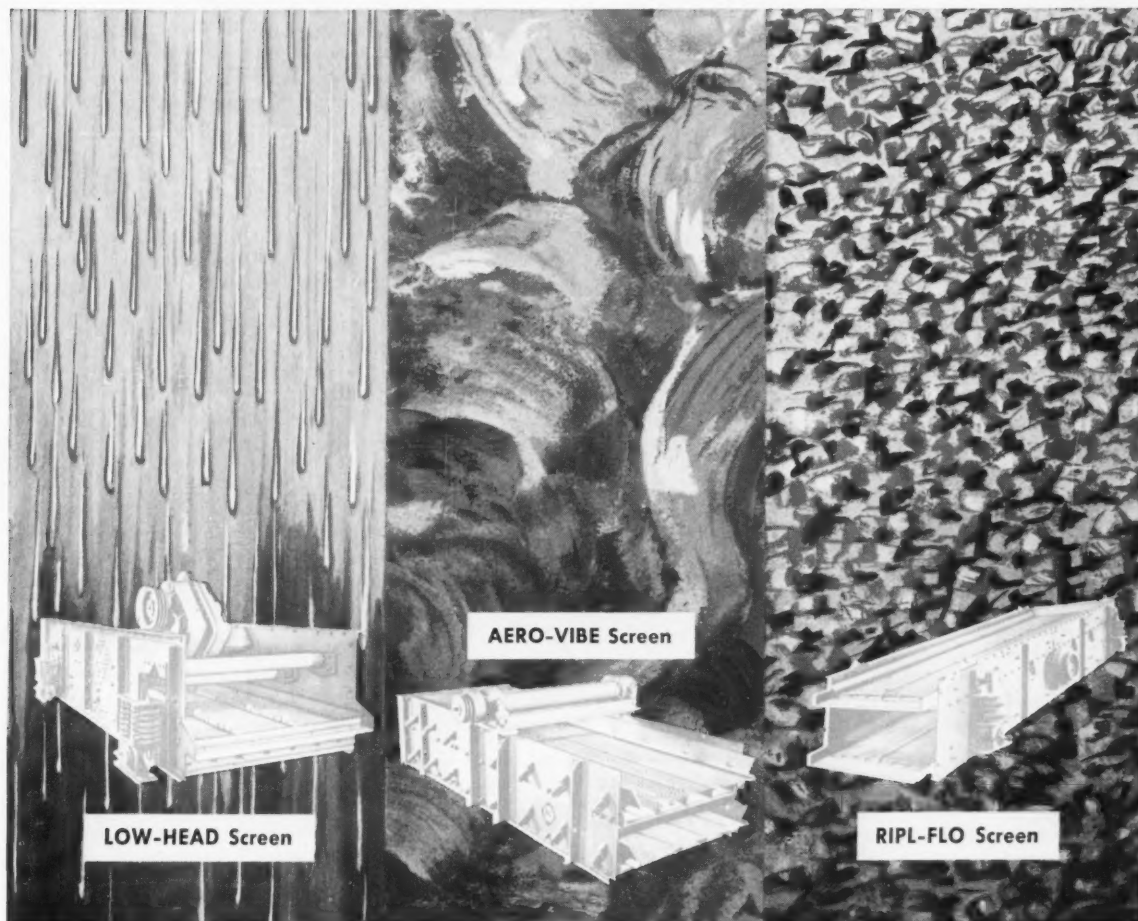
PAUL M. BUDZAK has been employed as safety director of the Freeman Coal Mining Corp., Chicago. His new responsibilities will include personnel duties. Mr. Budzak started his career as a practical miner with the Wheeling Steel Co. at its Harmar mine and after 5 yr with this company entered Pennsylvania State University from which he graduated in 1944 with a BS degree in mining engineering. His first job upon graduation was as an explosives engineer with American Cyanamid & Chemical Co. after which he was employed as mining engineer by the Little Cahaba and Blocton Cahaba Coal Companies in Alabama. After 3 yr and a promotion to general superintendent, he accepted a position as safety inspector for the American Re-Insurance Co. in which capacity he inspected coal and iron ore mines throughout the U. S. With this company for 10 yr, Mr. Budzak then joined Republic Steel Corp. as safety supervisor. Assisting Mr. Budzak in his new post in safety will be **Frank Kolisek** and **Dayton McReaken**, safety inspectors, and in personnel, **Harry Treadwell Jr.**, employment supervisor.

eral manager of the Carbon Fuel Co., and will headquarter in Charleston, W. Va. **D. B. Shupe**, superintendent at Wharton No. 2, Eastern Gas, will succeed Mr. Cobb. Replacing Mr. Shupe is **R. H. Freeman**, superintendent at Wharton No. 1. **Wayne M. Plymale**, superintendent at Beards Fork (which closed recently), becomes superintendent at Wharton No. 1.



David R. Mitchell, professor of mining engineering and chairman of the Div. of Mineral Engineering at Pennsylvania State University, has been named associate dean of the College of Mineral Industries. Mr. Mitchell received his BS degree in mining at Penn State in 1924 and his MS degree 3 yr later. In 1930 he received the degree of Engineer of Mines from the University of Illinois. (Continued on p 40)

ALLIS-CHALMERS



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Depend on Allis-Chalmers for a high capacity, low-maintenance, dependable screen to fit your operation exactly. Whether it's for wet or dry process, light or heavy feed, coarse or fine sizing, the right screen for you is the one that is designed to do a specific job.

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SH RIPL-FLO INCLINED SCREENS

for light scalping, coarse to fine wet or dry sizing and rinsing. Balanced two-bearing mechanism. Wire cloth, perforated plate or parallel rod surfaces. Maximum aperture, 5 inches. 1, 2 or 3 decks.

Current Coal Patents

By Oliver S. North

Blasting methods and materials, J. E. Lambert and I. O. Lewis (assigned to Imperial Chemical Industries Ltd., London, England), Oct. 11, 1960. In an improved method for blasting in open pit workings, and particularly in coal strip mines, the vertical bore hole is simultaneously filled with optimum proportions of a stream of ammonium nitrate and one or more streams of the other ingredients of the blasting explosive composition, whereby the streams combine while filling the hole. The various ingredients can be handled separately with safety. No. 2,955,534.

Conveying apparatus, S. S. Lanier Jr., Oct. 11, 1960. In a continuous mine conveyor adapted for conveying coal around curves and over supporting surface having dips and rises therein, the units are connected to each other by linked segments resembling vertebrae whereby the belt will follow any curvature or change in alignment. No. 2,955,699.

Belt conveyor cover, J. B. Long and C. E. Johnston (assigned to Marmon-Herrington Co., Inc., Indianapolis, Ind.), Oct. 11, 1960. Design for a cover for belt conveyors that are exposed to the elements, e. g. conveyors used for transporting coal from an open pit mine to a washery. The cover is mounted directly on the belt conveyor and is supported upon spaced flexible strands of wire or rope. No. 2,955,702.

Tunneling machine having stepper type advancing means, C. W. Kandle, Oct. 11, 1960. In a machine for boring a relatively large tunnel, e. g. in a coal mine having a thick seam, the apparatus is mounted on wheels or skis and has a housed tapered spiral auger behind the cutting heads for moving cuttings. The roof is better supported than by usual practices, and workmen are protected in timbering close to the face. No. 2,955,808.

Mining planers having an impact action, J. Herrmann (assigned to Gewerkschaft Eisenhütte Westphalia, Wethmar, Germany), Oct. 11, 1960. Design for an improved mining planer which will utilize the irregular forward motion of the planer head to obtain an increased efficiency in output. This invention covers improvements in the planer described more fully in U.S. Patent No. 2,873,959, issued to the same patentee. No. 2,955,809.

Cutting device for the continuous cutting of coal and the like, C. E. Mc-

Whorter and J. S. Newton (assigned to Goodman Mfg. Co., Chicago, Ill.) Oct. 11, 1960. In a continuous mining machine, the rotary cutters are so positioned as to provide a cutting pattern for increasing the proportion of lump coal and for cutting through hard inclusions, such as sulfur balls and the like, in the seam of coal without undue stress on the cutters. The depth of penetration of the trailing bits in a hard inclusion is determined by the gage of the preceding bits. No. 2,955,810.

Process for carbonizing coal in a laminar gas stream, J. J. S. Sebastian, Oct. 11, 1960. Economical and versatile process for the low-temperature carbonization of coal, including low-grade bituminous coals, to produce primary low-temperature tars and a highly reactive, smokeless char or semi-coke. No. 2,955,988.

Drying method and apparatus, C. W. Gordon (assigned to Combustion Engineering, Inc., New York, N. Y.) Oct. 18, 1960. In an improved method of drying coal, sized coal is introduced into a stream of hot drying gases directed horizontally and then vertically with sufficient force to entrain the coal pieces and particles less than 3/8-inches in size. The coarse fraction is then dried in a horizontal gas flow. No. 2,956,347.

Mining machine chain and pintle, C. B. Krekeler (assigned to Cincinnati Mine Machinery Co., Cincinnati, Ohio), Oct. 18, 1960. Design for a mining machine pintle having a bearing area equal to the largest possible bearing area obtainable with the chosen pintle diameter. The pintle is locked in the chain against rotary movement by its configuration and against longitudinal displacement by the natural forces encountered in the use of a cutter chain. No. 2,956,442.

Method of making carbonized briquettes, L. Burgess (assigned to Sam Tour and Louis Burgess, addresses not listed), Oct. 18, 1960. In the making of coke briquettes, the raw mixture comprises 20-56% bituminous coal and the remainder a metal or metalloid oxide. No. 2,956,868.

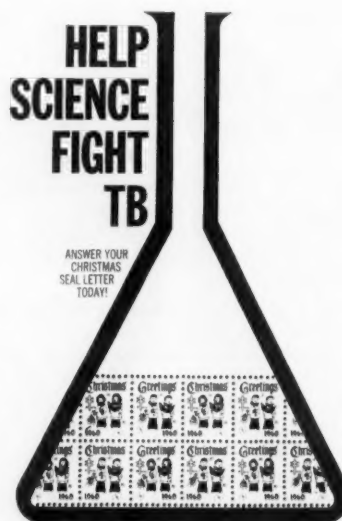
Flotation separating apparatus and method, W. P. Connelly (assigned to Provident Trust Co. of Philadelphia, Philadelphia, Pa.), Oct. 25, 1960. In the heavy media separation of coal from refuse, a means is provided for the continuous withdrawal of refuse from the bottom of the separating chamber, whereby the apparatus can be of simplified construction and operated and maintained at lower cost as compared with previous heavy-media installations. No. 2,957,577.

Continuous miner with conveyor having vertically adjustable side walls, R. C. Lundquist (assigned to Goodman Mfg. Co., Chicago, Ill.), Oct. 25, 1960. Design for a continuous mining machine of the boring type that is adjustable for varying working heights and has a transversely pivoted pick-up conveyor in which the side walls of the conveyor are automatically increased in height as the working height of the machine is adjusted for cutting in thicker seams of coal. No. 2,957,686.

Impact head for setting mine-roof bolts, L. B. Bice (assigned to U.S. Steel Corp., Pittsburgh, Pa.), Nov. 1, 1960. Improved dolly having a cup for collecting dust generated as a slotted roof bolt is set and passages leading from the cup to the bore of a hollow stub steel, whereby suction can be applied to the passages and cup. No. 2,958,082.

Mine drilling machine, A. L. Lee (assigned to Consolidation Coal Co., Pittsburgh, Pa.), Nov. 1, 1960. In a drilling machine designed for use in underground mines and tunnels, a member is provided for guiding the drilling implement and holding it firmly against the face in horizontal or upwardly directed holes. No. 2,958,514.

Strata mining-adjacent seam hardness indicator, G. T. Felbeck (assigned to Union Carbide Corp., New York, N. Y.), Nov. 8, 1960. In the mining of coal by remote control, improved means is provided for indicating at a remote control station the relative hardness of a stratum above or below the seam being mined before the mining machine cutters are damaged in case the machine approaches a stratum that is hard enough to damage the cutters. No. 2,959,405.



How
another
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planned
for future
cost-cutting
efficiency
with
McNALLY
CAR HANDLING
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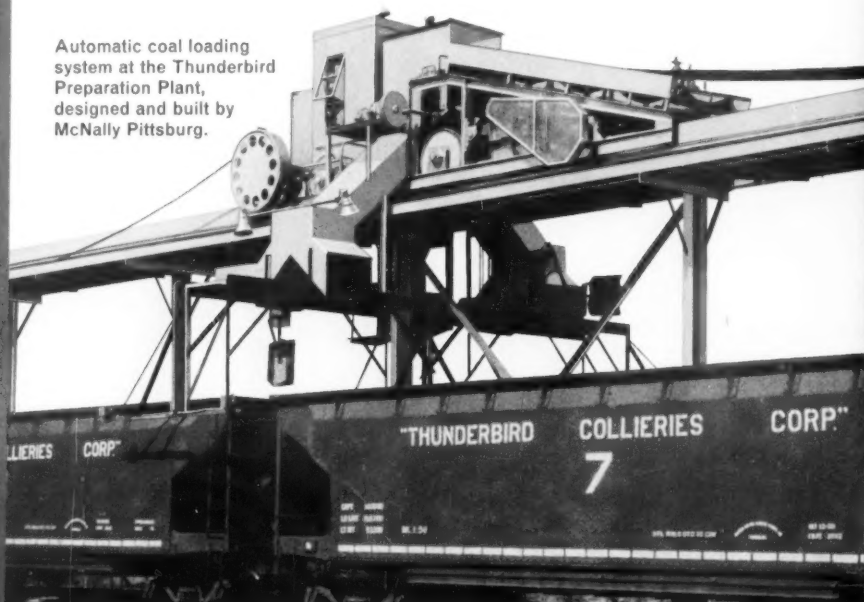


Another "Man from McNally"
report—how a leading
company solved its car
handling problems with an
automatic system from
McNally Pittsburg.

Automatic Loading Slashes Costs, Improves Profits

at the
Thunderbird Plant

Automatic coal loading system at the Thunderbird Preparation Plant, designed and built by McNally Pittsburg.



Here is a new concept in automation . . . exclusive with McNally Pittsburg . . . which makes it possible to load 28 cars automatically without an attendant!

This new system was installed for the first time at the Thunderbird Collieries Corporation plant, Sullivan, Indiana. It consists of a belt conveyor, motorized belt tripper, photoelectric devices, and complete pushbutton controls to load up to 14 cars on two separate tracks—automatically.

McNally Pittsburg's new automatic loading system has a motorized track selection gate so

that the coal can be loaded on either of two parallel tracks. Each track is provided with a motorized two-way loading chute to change loading from one car to the next in order to prevent spillage between coupled cars. Photoelectric cells and a coal paddle on each track provide automatic operation.

At the first startup, the tripper is manually positioned to start loading the first car. On subsequent operations, the tripper can be operated automatically. During automatic operation, the tripper changes tracks, reverses direction, and continues to load on the second track.

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MANUFACTURERS OF EQUIPMENT TO MAKE COAL A BETTER FUEL



Efficiency in car handling and loading depends on control—simple, fast, positive control of cars being loaded, regardless of loading out capacity. McNally Pittsburg engineers tailor the handling system to meet the needs of your plant production—give you the control, speed and efficiency necessary to cut costs and increase profits.

McNally Pittsburg makes a complete line of car loading and car handling equipment—from manual to fully automatic systems. Why not ask "The Man from McNally" to call today! His experience in coal handling problems has helped many to increase productivity and lower costs.

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Get the full facts and information about the McNally equipment you need for highest plant production today.

If you would like the "Man from McNally" to call—let us know. You'll find he has the "know-how" to answer your handling and preparation questions, whatever they are.

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Please send me information about the following equipment:

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- ☐ Washers
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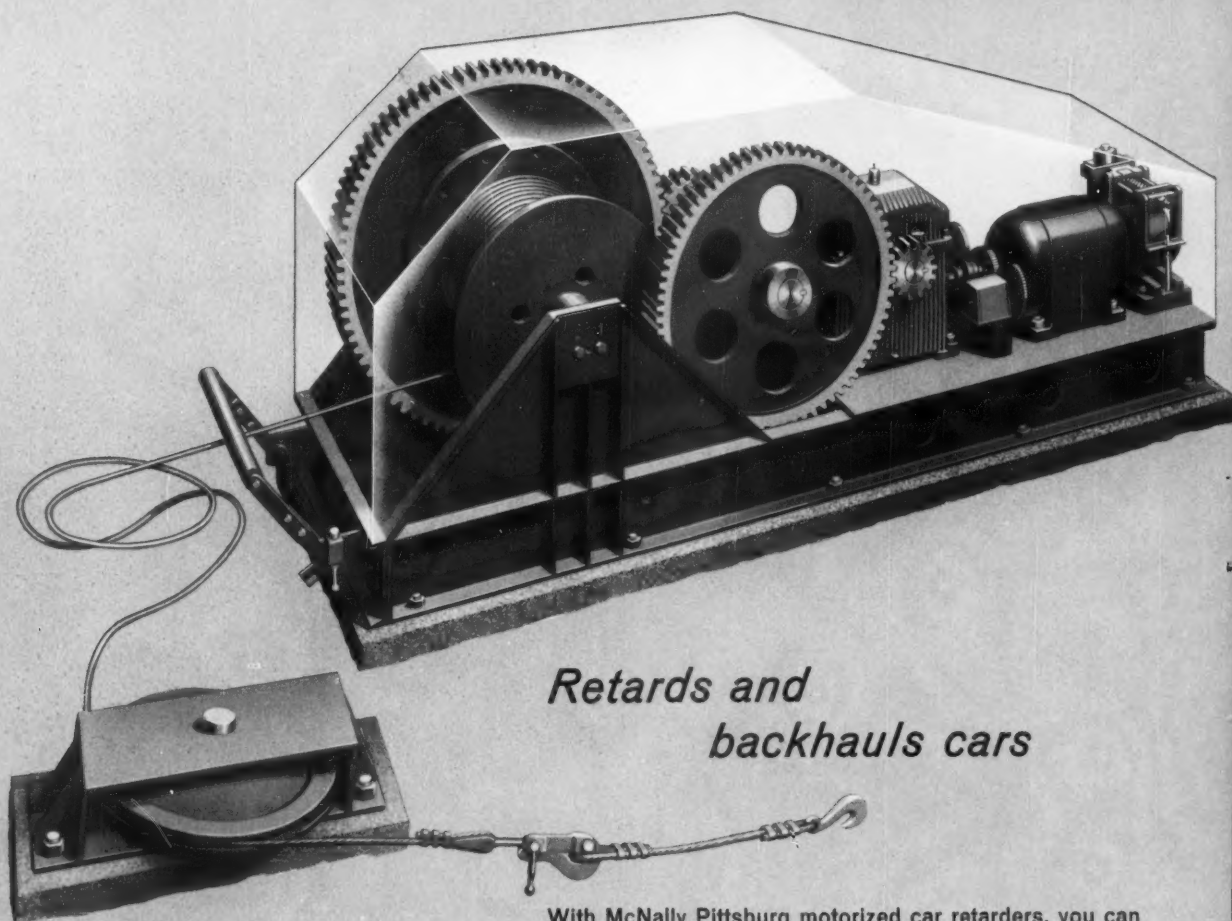
Manufacturing Plants:

Pittsburg, Kansas • Wellston, Ohio

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backhauls cars*

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CAR RETARDERS

With McNally Pittsburgh motorized car retarders, you can not only control the movement of cars down a graded track, but also haul the cars. Each retarder can handle three loaded or six empty cars at a speed of 30 feet per minute on grades up to 2½%. In addition, the retarders have a high speed cable rewind. Units are narrow enough to install between tracks, provided the unit is not set under the preparation plant.

McNally Pittsburgh motorized car retarders are designed for heavy duty. The cast steel cable drum, motors, and limit switches are mounted on a heavy, fabricated steel frame, and totally enclosed in a rigid steelplate cover.

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In the maritime field, STEPHENS-ADAMSON engineered push-button conveyor systems are attracting widespread attention for faster ship-to-shore unloading of bulk cargoes.

Dockside time is cut to a minimum with materials being unloaded at new fast rates and at a lower cost per ton. The simplicity of S-A bulk cargo handling systems lower the boom on obsolete handling methods. More trips per season . . . more dollar profits per ship go hand in hand with the installation of an S-A high capacity continuous flow conveyor system. Write for full details today.

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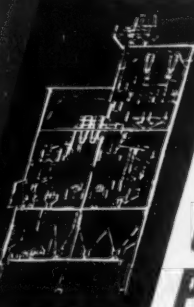
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the result of many
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The H & P Washing Cyclone Circuit assures the economical recovery of premium quality fine coal.

The most demanding market requirements as to ash contents of the product can be easily satisfied by controlled changes of the washing gravity.

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If you want to increase the yield of your overall operations by sharing in the growing market for clean fine coal, consult H & P's experienced staff. Discuss a suitable addition to your present preparation facilities or an entirely new plant. Odds are that a searching investigation will lead you to consider the application of H & P Washing Cyclones.

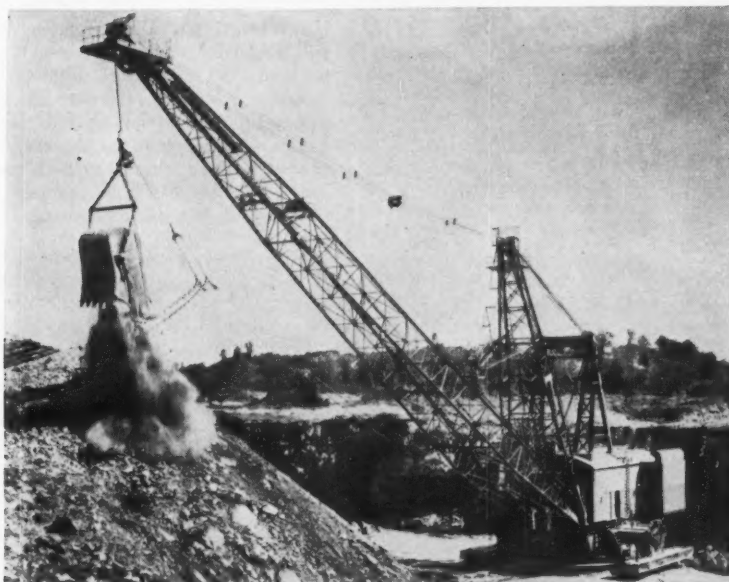
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Coal Abroad



Australia Imports Huge Dragline

TO PROVIDE FUEL for the completed Port Augusta "A" Station, the Leigh Creek coalfield in Australia is producing 700,000 tons of coal annually. Since future turbine installations are being planned for the Port Augusta "B" Power Station, Leigh Creek will have to increase its coal supply to Port Augusta to more than 2 million tons per year. Before this quantity of coal can be obtained, some 8 million tons of overlying soil and rock must be removed each year.

For this purpose Australia is importing a giant 1,000-ton dragline, similar to the one shown above. Largest ever to be imported into the country, the new dragline, being built by Bucyrus-Erie Co. at a reported total cost of \$2,840,000, will shift overburden at the rate of 800 tons per hr, scooping 24 tons at each bite from a depth of 140 ft. Utilizing its 240-ft boom, it will deposit the material into a dump 100 ft high. General Electric will supply DC excavator drive equipment to power the dragline.

Overseas Flashes

RUSSIA—Coal-gasification problems in the Soviet Union are being studied by 700 Russian scientists and engineers although the process has already been used to fuel industry for more than 15 yr, according to a Soviet report. A motion picture shown to visitors at the Exhibition of Economic Achievements says the Moscow underground gasification station has been in operation for 15 yr and produces one million cubic meters of gas per day. Several others also are said to be in operation around the country.

JAPAN—A 14-mo-old strike at the Miike coal mine, costing the Mitsui Mining Co. an estimated \$30 million, has been settled, returning the entire work force of over 12,000 men to their jobs. The Central Labor Relations Mediation Board

said the two unions and management accepted recommendations which include a modernization and personnel rationalization plan of the company.

GREAT BRITAIN—Vending machines for selling coal to the public may start appearing in the United Kingdom early next year. First model to be made available in the U.K. will cost around \$980 and will sell coal in packages of either 14 or 20 lb. Austin Hopkinson & Co. is expected to manufacture the machines, adapted to British requirements, under license from Charbonnages de France.

AUSTRALIA—Underground coal production in the State of New South Wales rose by 774,100 tons in the first 8 mo of 1960 as compared with the same period in 1959. Open-cut production rose by 159,700 tons and coal exports went up

(Continued on p 40)

"MINE EXAMINATION REPORTS AND VALUATIONS"

THIS BOOK has received enthusiastic endorsement of Mining Professors, Mining Engineers, Mine Managers and Accountants.

It will be an Authoritative Reference for many years on Valuation of Mining Properties.

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**STOP
GO
SAFE**



with the
**SCHROEDER
JABCO** **NEW**
Belt Switch

for CONVEYOR CONTROL

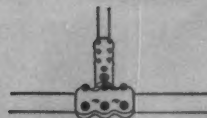
Here's the pilot circuit device for complete conveyor control that operates from either or both directions by pulling a cord! The JABCO starts and stops the belt from any point along the line with safety! If rock falls over the pull cord, the conveyor halts immediately, minimizing damage. Can be mounted on the roof, cross timbers or post. Weighs only 5 3/4 lbs.

Send for illustrated Bulletin No. 660 for complete description with installing and wiring instructions for belt conveyors and shaking and chain conveyors.

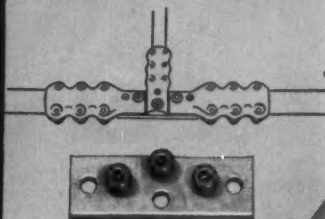
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O-B Designs for Mining Men:



** A quick-connecting, fast-moving, power-connection for high speed mine operation*



RESULT:

You can make connections between seven popular sizes of copper or aluminum cables... joining the same or different sizes... either copper or aluminum

FAST... The new O-B Cable Connector makes or breaks a cable connection simply with the turning of two cap screws. These sturdy fittings are especially designed for sections that are picked up and moved frequently.

VERSATILE... You can add or remove sections of cable to keep pace with fast machinery. You can make tap-offs, 3-way connections between cables, or a variety of switch and panel arrangements... all in minutes!

SIMPLE... Your O-B Cable Connectors give you the advantages of "built-in" cable connections that hook-up or disconnect simply. No specialist needed... saves time and labor on the job.

Write us... or see your local O-B sales-engineer to order the new O-B Cable Connectors. You'll find—as others have—that they make moving easier, faster, and considerably cheaper. OHIO BRASS COMPANY—MANSFIELD, OHIO, Canadian Ohio Brass Company, Ltd., Niagara Falls, Ontario.

Ohio Brass 

EXPANSION SHELLS AND PLUGS • LINE MATERIALS • SAFETY AND CONTROL EQUIPMENT • ELECTRIC HAULAGE MATERIALS

10051-M

People in Coal (Cont'd from p 30)

Mr. Mitchell served as engineer with the Bethlehem Mines Corp. from 1924 to 1926, and from 1927 to 1938, as instructor, assistant professor and associate professor of mining and metallurgical engineering at the University of Illinois. He then returned to Penn State and since 1944 has been chairman of the Div. of Mineral Engineering.

L. E. Woods, president, Crystal Block Coal & Coke Co., was elected 1961 president of the Operators' Association of the Williamson Field at its 46th annual membership meeting in Williamson, W. Va. Other officers elected were vice president, E. M. Bane, president, D. J. B. Collieries, Inc.; treasurer, L. E. Tierney Jr., president, Eastern Coal Corp.; and executive secretary, Joseph J. Ardigo.

Howard T. Batman has succeeded Ernest B. Agee as commissioner of the Indiana Coal Operators Association. Office headquarters of the association have been moved to 708 Ohio St., Terre Haute.

Obituary

C. N. Crichton, vice president, Johnstown Coal & Coke Co., Johnstown, Pa., passed away on Nov. 11 at the age of 48. Born in Johnstown, Mr. Crichton was a graduate of Lehigh and Harvard universities.

Coal Abroad (Continued from p 39)

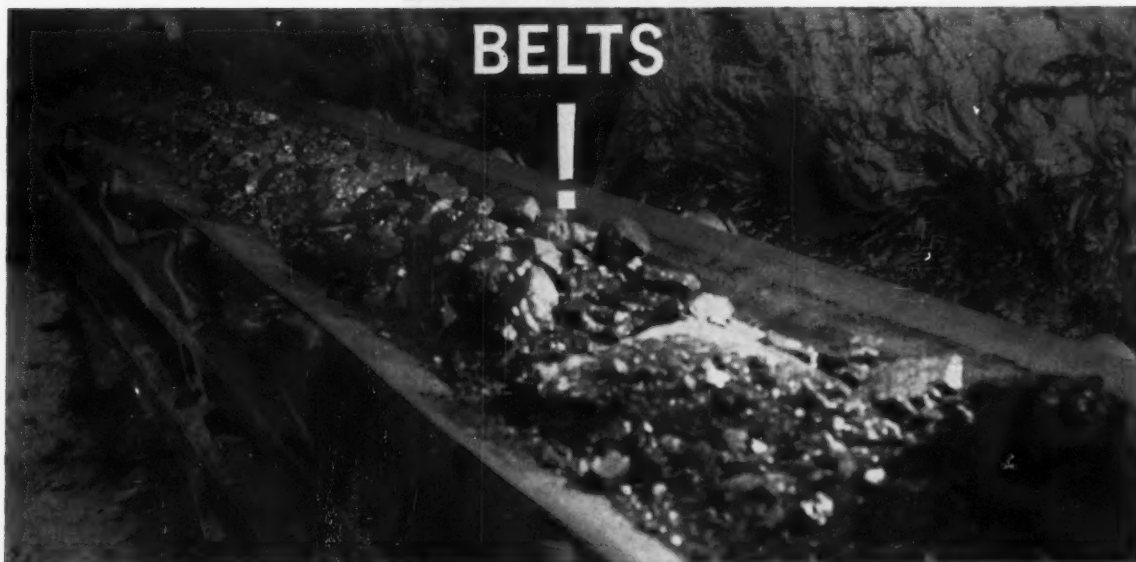
by 414,500 tons in the same period. Main overseas customer is still Japan, which bought 726,800 tons out of 860,100 exported.

INDIA—An atomic research reactor costing \$20 million and located at Trombay, near Bombay, will power one of the world's most powerful radioisotope producers. A result of an international project in peaceful uses of atomic energy, the "Canada-India" reactor is expected to meet India's demand for isotopes for agriculture, biology, industry and medicine.

A third blast furnace, ready for commissioning at the German-aided Rourkela project in India, cannot be lit for want of coal supplies. Coal production has fallen far short of the Second Plan target of 60 million tons. Third plan goals call for opening up virgin coal areas and much capital investment. Major objective in the coal program of this plan will be to ensure supplies of coking coal to the steel industry and high grade noncoking coal to the railways and other industries. A slackening in tempo of industrial production in the South is reportedly due to acute shortage in supply of coal caused by large-scale diversions to railways.

Things you should know about the

REVOLUTION IN CONVEYOR BELTS



There's a new look to coal mine conveyor belts—brought about by impregnating fiber with Geon vinyl. The “new look” belts are substantially different, substantially longer lasting, substantially better performing.

For example, woven-carcase belts impregnated with vinyl greatly reduce tearing, slitting and other mechanical damage. There are no plies to separate. There is no limit to length as there is on presently used belts—and if a belt can perform at lengths far longer than 2000 feet (vinyl-impregnated belts are doing so now) you can bet on this kind of toughness for the shorter runs, too.

You get smoother, better operation than you ever thought possible from a belt. Training ability is excellent. Stretch is not excessive. On-the-job experience has proved that life is far longer, maintenance requirements far less (one operator says he's getting twice the life on a punch-mining job—proving that vinyl-impregnated belts can handle the toughest, roughest kind of mining job).

In addition, Geon vinyl is unaffected by mildew,

moisture and oils. You can use both sides with equal efficiency, more service. Vinyl-impregnated belts work satisfactorily over an unusually broad temperature range. And . . . vinyl's inherent flame resistance completely eliminates fire hazard from belting.

Why do we present these advantages of belts made with vinyl? Because this is another example of the way Geon vinyl is improving products as well as making possible whole new applications and products never before available. We'd be glad to supply further information. Write Dept. KE-1, B.F. Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. In Canada, Kitchener, Ontario.



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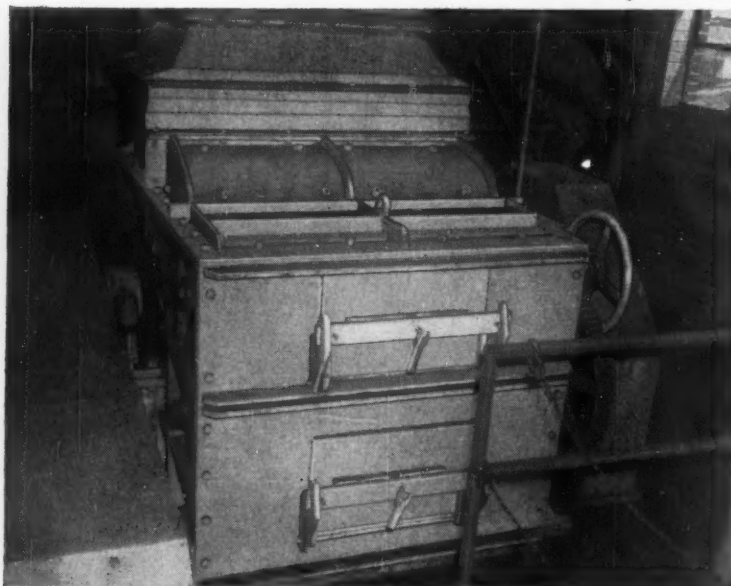


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"NO PARTS REPLACED IN 6 YEARS OF SERVICE"

The operation record at this municipal power station again proves the stamina and trouble-free performance of American AC Rolling Ring Crushers.

Although reducing ROM coal (up to 6" size) to $\frac{3}{4}$ " this crusher has never needed a part replacement. Over 334,000 tons of coal have been reduced since installation.

The double life of the American-originated rolling shredder ring brought further economy. The rings, which split coal instead of crushing it, are reversible. After four years the rings were reversed to put the unused edges to work. This adds more years to their operational life.

Since 1908, American Pulverizer has manufactured reduction equipment exclusively. Every crusher is custom-built to meet your requirements and ruggedly constructed to give you the lowest possible cost per ton of coal reduced.

Our Engineering Department will help you with your reduction problem and recommend the proper equipment.

Complete Literature Available. State your tonnage requirements.

6012

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ORIGINATORS AND MANUFACTURERS

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PULVERIZER COMPANY

OF RING CRUSHERS AND PULVERIZERS

ST. LOUIS 10, MISSOURI

News Roundup (Continued)

Thermal Plant To Be Built

A steam power plant, with capacity to burn about 400,000 tons of coal annually, is planned by Sierra Pacific Power Co. (Nev.). A site 17 mi east of Reno has been purchased for the project which will be named after the company president, Frank A. Tracy. Initial unit is expected to produce about 66,000 kw, roughly half of the utility's present peak load. At present Sierra "imports" virtually all its power from Pacific Gas & Electric Co. in California. Two 60-kv and two 120-kv lines bring power to a 15,000-sq-mi-area of northern Nevada. The new plant will connect to a present 60-kv line which will be converted to 120 kv. Construction is expected to begin in 1963 or 1964 to keep pace with population growth. The proposed plant is to be built as part of the utility's thermal program, already well underway. Plans include construction at Reno and Carson City of small diesel generating stations with total capacity of 63,000 kw to be used for peaking purposes.

Power Expansion

West Penn Power Co. has announced plans to build a \$43 million addition to its Mitchell Power Station near Monongahela, Pa. The turbogenerator, able to produce 250,000 kw of electricity, will be West Penn's largest generating unit as well as the biggest in the West Penn Electric System of which West Penn is a part. The new unit, expected to be in operation late in 1963, will more than double the capacity of Mitchell Station which now has two generators totalling 174,000 kw.

Oil Imports May Be Reduced

The Department of the Interior has issued a proposal which would result, if adopted, in a reduction of crude oil and unfinished oil imports east of the Rocky Mountains effective Jan. 1, 1961, according to Under-Secretary of the Interior, Elmer F. Bennett. Mr. Bennett emphasized a Presidential proclamation would be required to effect the proposed change. "While we cannot precisely predict the exact reduction because demand data and other pertinent information are not available, the import level could be about 60,000 barrels below the level which would prevail if the proposal were not adopted," Mr. Bennett stated.

WESTINGHOUSE

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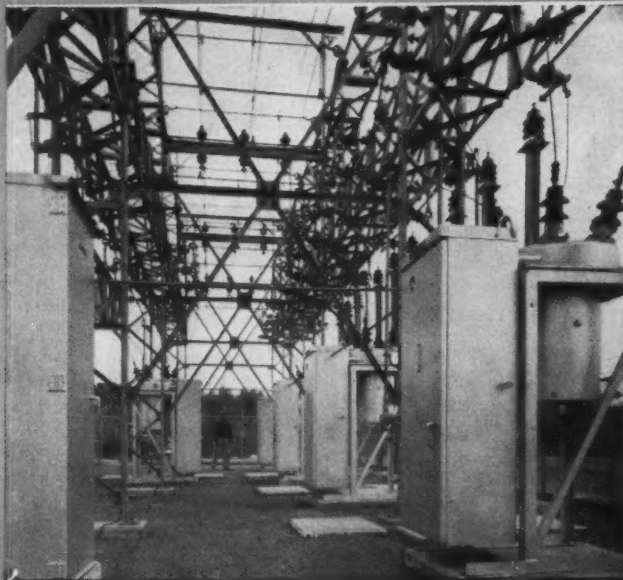
WESTINGHOUSE

WESTINGHOUSE

WESTINGHOUSE

NEW SOUTHERN ELECTRIC GENERATING COMPANY MINE USES A-C POWER DISTRIBUTION SYSTEM

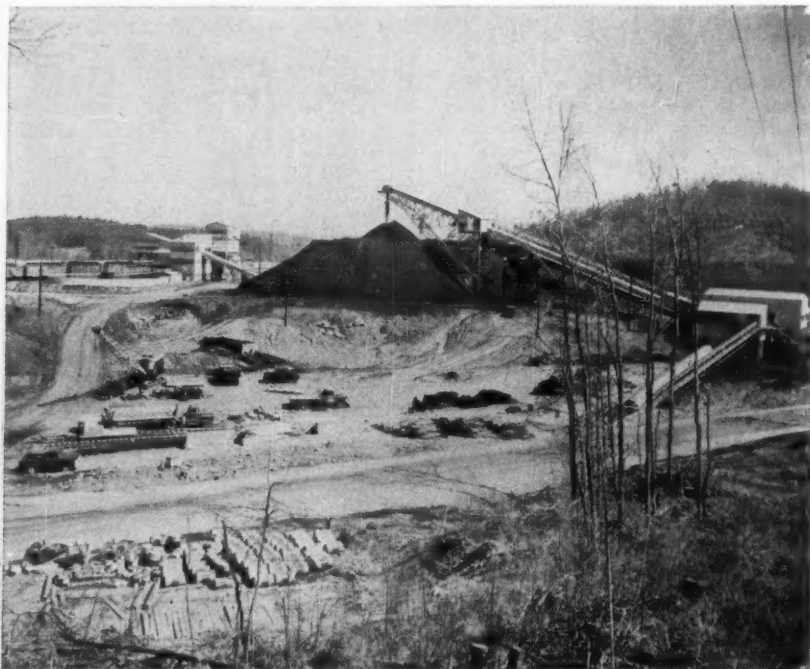
Increased economy, reliability and safety are just three of the many benefits gained from using a-c power in mining operations. At SEGCO Mine No. 1 in Alabama a new Westinghouse distribution system puts a-c power where it's needed at the voltages needed for top machine efficiency. Below, mine engineer inspects mine's main Westinghouse substation.



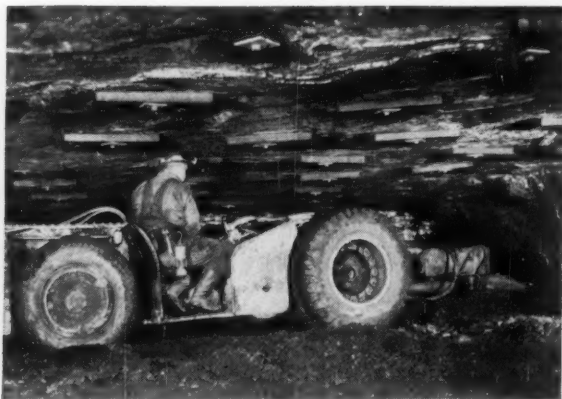
Westinghouse



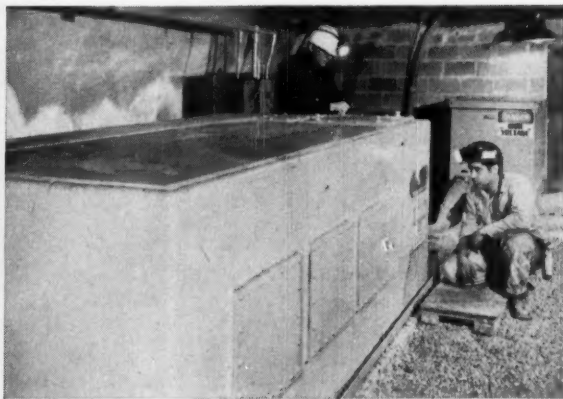
WESTINGHOUSE EQUIPMENT PUTS POWER AT FULL WORKING STRENGTH



Power for production: SEGCO Mine No. 1 is pioneering the use of a-c power in Alabama mining. A-c power, distributed by a Westinghouse system, has helped improve mining operations. All coal produced at the mine is shipped on special railroad cars to SEGCO's new steam generating plant at Wilsonville, Alabama.



On-the-spot-power underground at Mine No. 1 is provided by enclosed, portable Westinghouse power center transformers which carry high-voltage current very near the active face of the mine. Voltage losses



are low, machine operation more efficient. At left, electric undercutting machine in action. At right, mine chief electrician and C. J. Dornbusch, Westinghouse Sales Engineer, inspect power center. Safety disconnect switch is in background.

DIRECTLY AT THE WORKING FACE IN ALABAMA MINE

In the new Southern Electric Generating Company (SEGCO), Mine No. 1, at Parrish, Alabama, underground equipment steadily bites through the coal seams at top efficiency. Reason: the mine is the first large Alabama mine to use a-c power which permits high voltages to be carried right to underground work areas with minimum power loss. The mine receives uninterrupted power through a carefully planned and coordinated Westinghouse distribution system.

STANDARD WESTINGHOUSE EQUIPMENT makes up the mine's power system. A main 3750-kva substation reduces incoming 44,000-volt power to 12,400 volts. Auxiliary substations step power down to proper voltages for the ventilating fan, pumping station, conveyor system power center, maintenance shop and bathhouse.

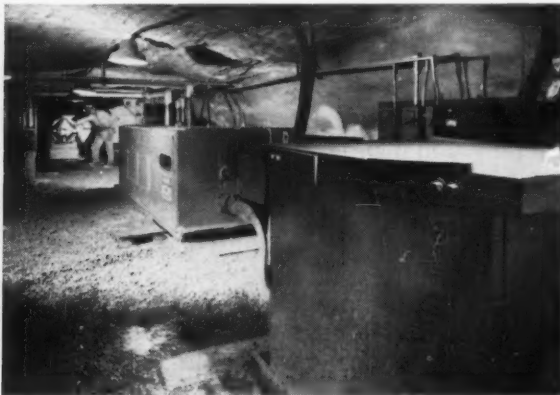
One Westinghouse 500-kva and two 1000-kva surface substations supply 4160-volt power to underground facilities. This power is stepped down to 440 volts by underground power center transformers. Because these small, lightweight, portable centers are easily moved, they can be kept near the machines they serve to deliver power over short distances at full working voltage. Other Westinghouse underground equipment: portable load break disconnects and switchhouses for maximum protection of miners and equipment.

The a-c power supply equipment, because it is simple, rugged and has few moving parts, requires less maintenance and supervision than complex d-c apparatus. Generally costs less, too. (cont.)

Westinghouse



Power for mine trolley is supplied by this 150-kw Westinghouse silicon rectifier which converts a-c to d-c. Track haulage system transports men and materials through main haulage entries. Rectifier requires little space, needs minimum maintenance and offers highest continuity of service and reliability.



Power for conveyor is supplied by a 500-kva Westinghouse underground power center protected by a 5-kv safety disconnect switch (foreground). At rear, mine chief engineer inspects a 225-hp Westinghouse Life-Line® "H" motor which drives crusher conveyor.

WESTINGHOUSE EQUIPMENT PUTS POWER IN ALABAMA MINE... (cont.)

This mine commenced production in August, 1959, now has five of nine projected sections producing about 5000 tons of coal daily. In reserve: necessary Westinghouse equipment to meet future power demands.

THIS RELIABLE POWER SYSTEM is the foundation for boosting coal production. To help mine operators attain this goal, Westinghouse has inaugurated a new concept called *Progressive Automation*. It is a long-term, step-by-step plan leading to economical automatic production. Your nearby Westinghouse representative is ready now to help you formulate your individual *Progressive Automation* plan. Contact him today . . . or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. You can be sure . . . if it's Westinghouse.

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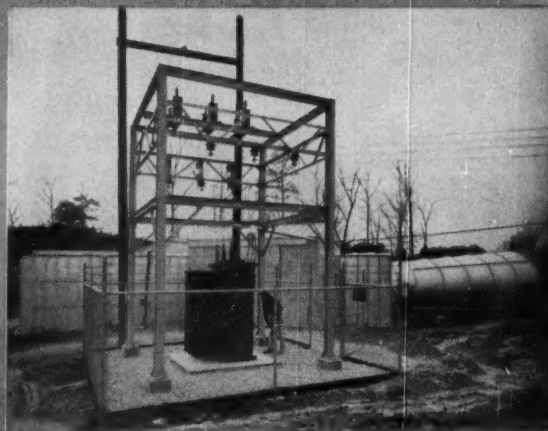


Westinghouse



Power for mining sections is provided by three Westinghouse substations which send 4160-volt a-c current through cables to underground transformers. The Westinghouse distribution system is designed for maximum flexibility so that power can be delivered over shortest possible distance as operations expand. Above, mine engineer checks nameplate at one substation.

Power for ventilation fans is supplied by this 500-kva Westinghouse substation. Substation has the remarkable new Westinghouse-developed Insuldur® insulation system which withstands higher operating temperatures with no additional loss of insulation life.





HOLD FINES TO A MINIMUM

WITH JEFFREY CRUSHERS

Rolls on Jeffrey double roll coke sizers are fitted with renewable segments having thin, blade-shaped teeth. These provide a cutting action especially designed for handling coke. Sizing is surprisingly accurate and fines are held to a minimum. Whether you plan to size 8 tons per hour or 400 tons, there is Jeffrey equipment to handle the job — to pass a $\frac{3}{4}$ -inch screen or through 4-inch openings. For help on coke sizing, get in touch with The Jeffrey Manufacturing Company, 912 North Fourth Street, Columbus 16, Ohio.



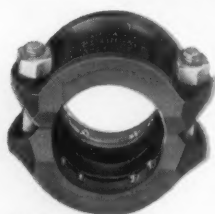


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NEW PLAINLOCK COUPLINGS AND FITTINGS

For Low Cost Jointing of Plain End Pipe



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FOR BETTER AND EASIER PIPING



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Malleable Iron Fittings



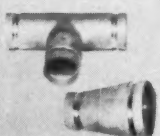
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VICTAULIC COMPANY
OF AMERICA
Dept. 12-12, P.O. Box 509, Elizabeth, N. J.

News Roundup (Continued)

10-Year Coal Contract

Signing of another long-term contract for coal has been announced by W. S. Webster, president of Snow Hill Coal Corp., Terre Haute, Ind. Negotiation for a \$50 million, 10-yr coal purchase agreement, was completed by Public Service Co. of Indiana, Inc. and Walter Bledsoe & Co., Viking Coal Corp. and Snow Hill Coal Corp. of Terre Haute.

A forward looking extension of a long-term contract between the two companies, the agreement calls for Public Service to purchase an estimated 13 million tons of coal from the Bledsoe companies, as noted by R. A. Gallagher, Public Service Co. chairman. Under the terms of the new agreement, the Bledsoe companies will produce approximately 1,300,000 tons of coal annually to meet the entire yearly coal requirements of Public Service Co.'s Dresser and Wabash River Generating Stations located at Terre Haute. This annual requirement is expected to greatly increase at such time as Public Service Co. installs additional generating capacity at either station.

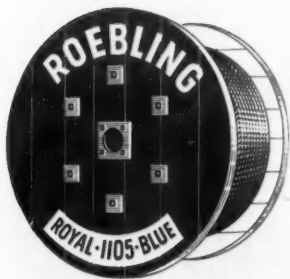
Since Public Service will purchase the entire annual coal output of 675,000 tons from Bledsoe's Viking mine and 625,000 tons from the Green Valley mine, Mr. Bledsoe has announced the expenditure of more than \$1,725,000 for the installation of new coal mining equipment to facilitate coal production at those mines.

Shipping Coal By Wire Looms

Tests underway on extra high transmission voltages are increasing the possibilities of shipping coal by wire; that is, converting coal into power at or near the mine-mouth and then moving the electricity substantial distances to market. Speculation as to future potentialities of such systems has increased recently through a series of developments and statements — Pennsylvania Electric Co.'s test of 460,000-V transmission line near Altoona; 750,000-V test transmission lines under construction by both Westinghouse Electric Co. and General Electric Co. and cooperating utilities, and a statement by a Westinghouse engineer that 1,000,000-kw generators will be built in the U. S. within the next 15 yr. America's utilities now operate their transmission systems at a maximum of 345,000 V and the largest generator in operation today is rated at 475,000 kw.



ROEBLING ROYAL BLUE WIRE ROPE DESIGNED AND MADE TO SERVE YOU WELL



ROYAL BLUE: *We put a lot of work into it—You get a lot of work out of it.*

This is the inside view of Roebling Royal Blue — its core has been removed to show the uniformity and symmetry of the rope structure. It's not only what's outside that counts; it's what's *inside* as well. You see how concerned we are with internal security.

All the inspections and tests that Royal Blue goes through enable us to know that the rope we build will do what we sell it to do. These quality control measures help us — as they do you — to take the *long* view of Royal Blue. A brochure on long-lasting Royal Blue, its resistance to shock, abrasion, crushing and bending, is available on request. Ask your Roebling wire rope distributor or write to Roebling's Wire Rope Division, Trenton 2, New Jersey.

ROEBLING 

Branch Offices in Principal Cities • John A. Roebling's Sons Division, The Colorado Fuel and Iron Corporation

Introducing a new service to the Mining Industry!

Rebuild

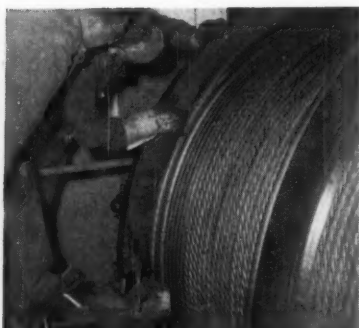
YOUR PRESENT DRUM

at your mine site

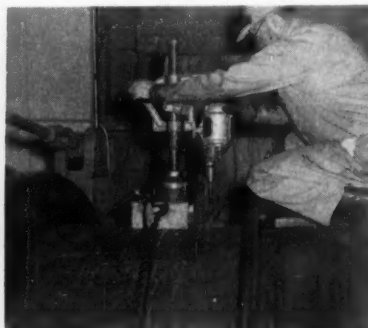
WITH LEBUS GROOVING

and at the same time obtain LeBus Controlled Spooling for multilayer spooling operations

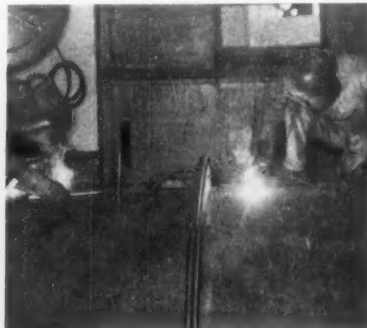
- Change your cast iron drum core and flanges to steel
- Change groove size for larger lines when going deeper
- Increase wire line service over any present multilayer spooling
- Eliminate cutting through of line and excess scrubbing at the crossovers



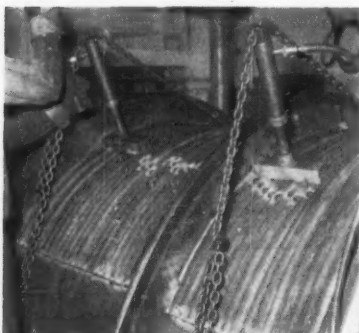
(1) This view shows one method of removing tapered wedges or end fillers on helical grooved cast iron drum.



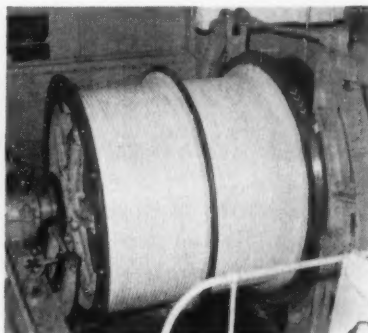
(2) Shows process of drilling a steel sleeve to be bolted to a cast iron drum.



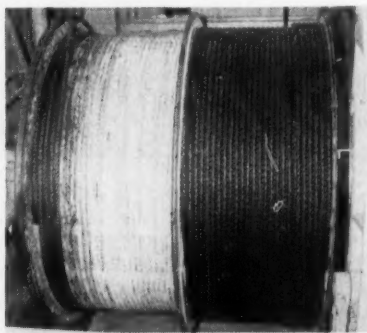
(3) Shows installation of steel sleeves and steel wear plates on the flanges and welding the sleeves and plates firmly together giving a complete steel drum core and flanges.



(4) Shows installation of LeBus grooved segments to the steel drum core by the process of welding.



(5) Completed installation showing LeBus Counterbalance Spooling System installed on a 72" by 36" double drum for 1-1/4" line.



(6) View shows overwind and underwind spooling operation where 3 and 1/2 layers of 1-1/4" line are being spooled on to the drum.

Five more skips per hour have been made possible by installation of this LeBus Counterbalance Spooling.



LEBUS INTERNATIONAL ENGINEERS, INC.

Box 2352, Longview, Texas

Phone: PLaza 8-5522

Fairmont Machinery Company
P. O. Box 992 Telephone: 1672
Fairmont, West Virginia

Salmon and Company
P. O. Box 2388 FAirfax 4-0625
Birmingham, Alabama

Western Machinery Company
P. O. Box 1498 CHapel 2-1983
Grand Junction, Colorado

Western Machinery Company
P. O. Box 2548 INGersoll 2-1983
Salt Lake City, Utah

NEW! CARMET® BR and RB Quick-Change Bits

For Faster Changes... For Longer Life

Faster bit changes and fewer of them are yours with the new Carmet cutter bits designed for tool blocks using a Neoprene cylinder to hold bits without setscrews. Special Carmet advantages make cutting easier, tools last longer.

B style has a flat, square back gage stop to prevent tearing the block and wearing the neoprene, and a front removal notch. RB has a front gage stop and back removal notch for applications where it is easier to remove the bit from the back. The RB's two step tip design leads to easier regrinding, and lower grinding costs.

Detail features of these bits are shown at the right, and both are available with open faced, full radius carbide inserts (designated B and RB), or with the round, cylindrical plug insert (designated BR and RBR).

Why these new Carmet Cutter Bits are Better and Last Longer

- ✓ Gage stops are flat — designed to prevent battering and swedging of tool blocks.
- ✓ Gages are a full $\frac{3}{8}$ inch and have smooth edges to eliminate splitting and mushrooming of blocks. This design also insures longer life for the Neoprene cylinder that holds the cutter bit.
- ✓ Three grades of carbide are available in Carmet cutter bits—to give you long life by matching the right carbide grade to your cutting requirements.

Quality Is In Every Carmet Cutter Bit

Carmet makes its own cemented tungsten carbide inserts. Carmet control over all phases of bit manufacture is your guarantee of top quality.

Call on your local Carmet distributor for mining tools with quality built in all the way through. He has complete stocks of the Carmet tools you need and can help you in their selection because he knows local mining conditions. And, your Carmet distributor is always glad to send out the Carmet field engineer to help you solve tool problems and cut mining costs—or even set up an entire tooling program for your particular mining operation.

Insist on the best in tools and local service. For a catalog supplement sheet on the BR and RB quick change bits, call your local Carmet distributor (see list), or write: Allegheny Ludlum Steel Corporation, Carmet Division, Ferndale, Detroit 20, Michigan. Address Dept. CA-12.

CARMET® 
CEMENTED CARBIDE • DIVISION OF ALLEGHENY LUDLUM

BR-3
Special Cutter
Bit



Front
Removal Notch
Three Carbide
Grades to select from
Maximum clearance
for easier cutting—no
heeling or drag Flat, square gage stop
Notch for Neoprene Cylindrical
wedge

B style cutting bits are the same as
above with an open-faced radius
Carmet Carbide insert.

RB-3 Special Cutter
Bit With Front
Gage Stop



Easier regrinding—
saves grinding costs
New removal notch

Flat Gage Stop prevents wear on
block and Neoprene

RBR-3 style cutting bits are the same
as above with a round cylindrical
Carmet Carbide plug-type insert.

Get more information from your local Carmet distributor:

Supplement to the Carmet Mining
Tool Catalog lists advantages and
quantity prices of the new time-
saving bits. For your copy see your
distributor, or write Carmet.

Birmingham Bolt Co., Ensley, Ala.

Bluefield Hardware, Bluefield, W. Va.

Brace-Mueller-Huntley, Inc.

Offices: Buffalo, Rochester &

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Carbon Transfer, Helper, Utah

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Consolidated Supply Co., Picher, Okla.

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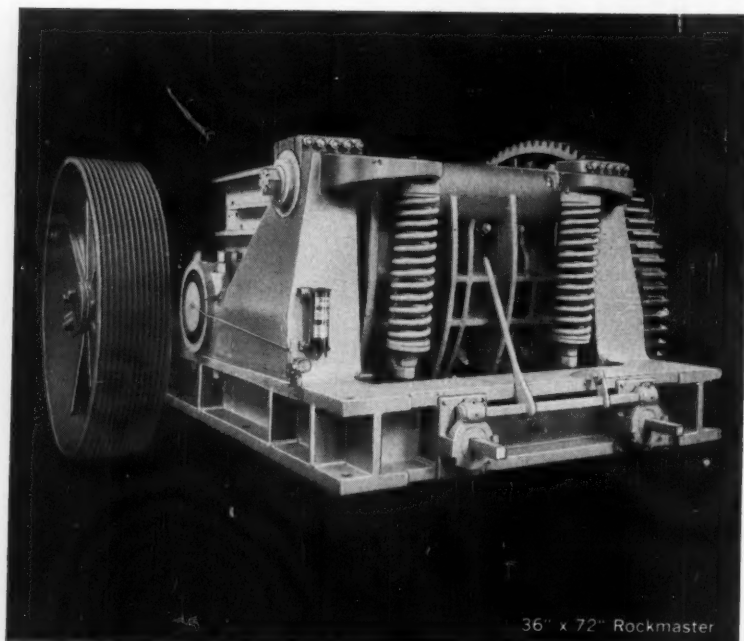
Union Supply Co., Denver, Colo.

Vanguard Supply Co., Chicago, Ill.

R. A. Young & Sons, Inc., Fort Smith, Ark.

world's **FINEST** **CRUSHERS**

for rock, slate and other mine refuse



High in capacity and ruggedly constructed, Rockmasters have the strength for economy and long service in the coal industry's most severe crushing applications. Steelstrut Toggle automatically releases tramp iron, while the Quick-Adjustment controls size ranges. Other advantages: Extraordinary ratios of reduction, lower power and maintenance costs, excellent resale value. *Get all the facts from Bulletin RMTD-56.*



ROCKMASTERS

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News Roundup (Continued)

Funds Needed for Dewatering

Mines in the Scranton, Pa., area were permitted to flood starting Nov. 1 while \$9 million in federal-state funds for dewatering of anthracite workings go unused, according to reports. The millions of dollars available to coal operators to assist in mine pumping may be lost by congressional recall along with millions of tons of the nation's coal reserves. The fact that operating and maintenance costs must be borne by the sponsoring coal company has discouraged most mine operators from taking advantage of the present dewatering program.

The only hope held out was the possibility of amending the federal and state acts which established the mine dewatering program in 1955 to make it more useful to mine operators. Such hope may be realized in view of the fact that Congressman Daniel J. Flood has announced he will introduce an amendment to the Mine Drainage Act permitting the use of federal funds to operate and furnish power for the pumps installed in area mines.

No Deaths

There were no deaths in Illinois' coal mines during August, September and October, Director Ben H. Schull of the State Dept. of Mines and Minerals reported. Over this period approximately 13 million tons of coal was mined. This record was only excelled in Illinois coal mines in 1958 when mines operated 114 days without a fatality, producing 15½ million tons over that period. During the first 7 mo of 1960 eight men were killed in mines.

Coming Meetings

National Conference on Water Pollution, Dec. 12-14, 1960—Dept. of Health, Education, and Welfare, Washington 25, D. C.

Coal Mining Institute of America, 74th annual meeting, Dec. 15-16, 1960—Penn-Sheraton Hotel, Pittsburgh, Pa.

International Symposium on Mining Research, sixth of a series, Feb. 22-25, 1961—University of Missouri, Rolla, Mo.

AIME Annual Meeting, Feb. 26-Mar. 2, 1961—Ambassador and Chase-Park-Plaza Hotels, St. Louis, Mo.



USS Tiger Brand hoist ropes and boom supports help keep this 25-yard dragline on the job around the clock.

Tiger Brand hoist ropes **last over 1,800 hours on 25-yard dragline**

This big dragline works around the clock—three shifts a day—at the Harmattan Mine of Fairview Collieries Corporation, Danville, Illinois. The twin hoist ropes last over 1,800 hours in this rugged service.

The USS Tiger Brand hoist ropes are two inches in diameter and 450 feet long. They are made of tough Monitor steel which has a reputation for long service on jobs like this.

The upper boom supports are also Tiger Brand—six two-inch diameter galvanized boom support strands 118 feet long. These are noted for their strength and resistance to vibration fatigue. Most of the largest shovels in the country are equipped with USS Tiger Brand Boom Support Assemblies because of their reputation for safety and long service life.

Why USS Tiger Brand is your best buy. Tiger Brand Wire Rope is designed by one of the industry's most capable staffs of wire rope engineers. It is made

by a company that maintains the most complete research and manufacturing facilities in the steel industry. When you buy Tiger Brand you get the right rope for the job. And your installation is no further away than a phone call to experienced American Steel & Wire field service representatives.

You can get Tiger Brand Wire Rope for any type of mining service. For information, write American Steel & Wire, Dept. 0482, 614 Superior Ave., N.W., Cleveland 13, Ohio.

USS and Tiger Brand are registered trademarks

**American Steel & Wire
Division of
United States Steel**



Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors
United States Steel Export Company, Distributors Abroad



This mark tells you a product is made of modern, dependable Steel.

Austin Permissibles cut loading costs



Loading costs and cleaning expense are important factors in the profit picture of many deep mines. And, they are factors that can be closely controlled through use of the right permissible dynamites.

Austin produces permissibles which solve virtually every problem connected with production of coal. They are available in speeds and strengths that meet such varying conditions as heavy binders, hard rock, thin seams, excessive water, etc.

Your Austin representative will gladly survey your present operation and show you how the correct type of permissible can save you time and money. Call him today or write Austin Powder Company in Cleveland.

AA-9055



AUSTIN
POWDER COMPANY
CLEVELAND 13, OHIO

explosives ♦ low grade ammonium nitrates ♦ primers ♦ blasting supplies
detonating fuse and connectors ♦ AP drill heads ♦ mine tools

News Roundup (Continued)



Fred B. Bullard

Ky. Fetes Coal

A vote of confidence in the coal industry was cast by Kentucky's leading citizens Nov. 10 at Lexington. Led by Gov. Bert T. Combs and Lt. Gov. Wilson W. Wyatt, a party of more than 100 state officials, industry leaders and other visitors inspected the latest type coal-fired boilers and attended a luncheon in tribute to the state's coal industry. Host for the day's festivities was the Kentucky Coal Association, whose executive secretary, Fred B. Bullard, explained that the "Coal Day" activities were arranged to "reacquaint the public with coal's importance to the State of Kentucky, to the national economy and security and to commercial fuel consumers." B. F. Reed, president of the Kentucky Coal Association, presided at the luncheon. Speakers included Stephen F. Dunn, president, National Coal Association and Joseph E. Moody, president, National Coal Policy Conference.

Gas Import Request Dismissed

Application of Tennessee Gas Transmission Co. to import an additional 204 million cu ft of natural gas daily from Canada near Niagara Falls, N. Y., was dismissed by a Federal Power Commission trial examiner. The action was based in part on the motion made by Jerome J. McGrath of Fuels Research Council, representing coal, railroad and labor intervenors. The examiner said Tennessee Gas had not met the requisites of the Natural Gas Act, especially in failing to show a market and need for the gas.

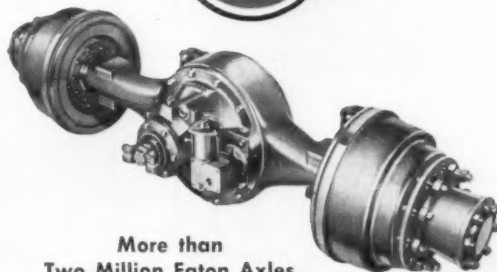


Ask Any Truck Serviceman about Eaton 2-Speed Axles

Ask the man who has to keep trucks rolling. He'll tell you that Eaton 2-Speeds not only operate for long periods without attention, but that they also cut deep into over-all maintenance costs.

No one knows like a truck serviceman that matching axle gear ratios to the hauling job means easier going for all power units from engine to axle shafts. Eaton 2-Speeds let drivers select from twice the conventional number of gear ratios—the right ratio for the immediate road and load condition. Trucks stay on the job, out of the shop—last thousands of miles longer. And Eaton's many exclusive design features hold down maintenance on the axle itself. When repair is necessary, Eaton's simplified construction speeds the work and slices off costly hours of labor.

Before you specify driving axle equipment, let a truck serviceman give you the low-down on Eaton 2-Speed Axles.



More than
Two Million Eaton Axles
in Trucks Today

EATON

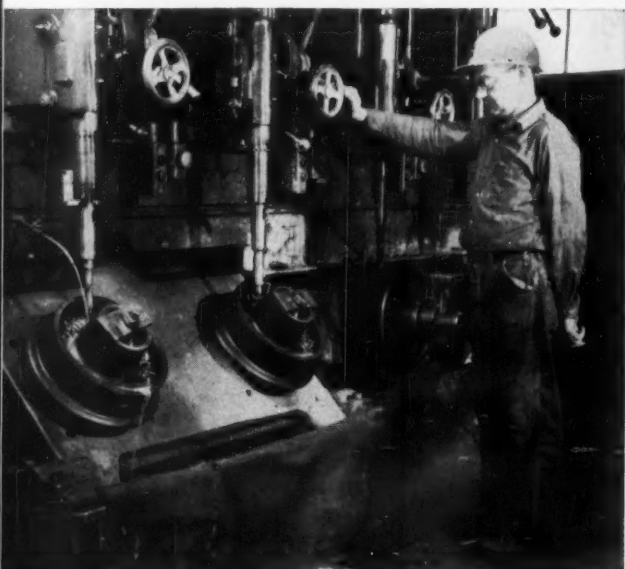
AXLE DIVISION
MANUFACTURING COMPANY
CLEVELAND 10, OHIO



1. Steam hammer forges a heated blank to general contours of a Bethlehem Mine Car Wheel. Next, forging flash is cut off in trimming press, and hole is punched through hub.



2. This boring mill, first of several in production line, trims the flange, rough-bores the wheel, faces the back-hub. Wheel is then reversed and the front hub is faced.



3. After bearing seats are rough-, semi-, and finish-bored, this 4-spindle multiple drilling machine drills and taps for grease fitting, as well as for hub cap holes.



4. Final step in production of Bethlehem Mine Car Wheels is the inspection of finished wheel. Every Bethlehem mine car wheel receives the same rigid inspection.

Making the best mine car wheel of them all

Over the years, thousands of heavily laden trips have proved the dependability and long-range economy of Bethlehem Forged-Steel Mine Car Wheels. *Not one of these wheels has ever been reported to have suffered a broken flange, or failure of any kind.*

Made by the most modern methods, Bethlehem wheels have great strength, toughness, and resilience.

They are suitable for any speeds, or operating conditions. All wheels are furnished machined, ready for installation. For further particulars, write to our nearest sales office for a copy of Folder 716, "Bethlehem Forged-Steel Mine Car Wheels."

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Sales Bethlehem Steel Export Corporation



for Strength
... Economy
... Versatility

BETHLEHEM STEEL



HOW JOY KEEPS IDLERS BUSY LONGER UNDER DIRT, DUST

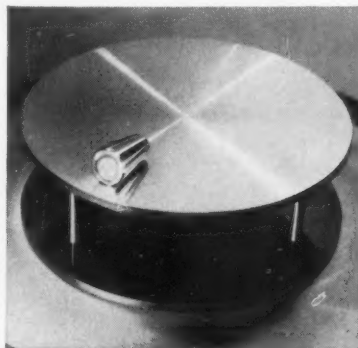


By switching to Timken® tapered roller bearings, Joy Manufacturing improved sealing for its Limberoller® two-bearing, single-unit Conveyor Idler . . . reduced bearing failures caused by dirt, dust, moisture. They also have continuous, smooth spillage-free and trouble-free operation. Timken bearings hold the idlers on center at all times, increase sealing efficiency, keep belt moving smoothly.

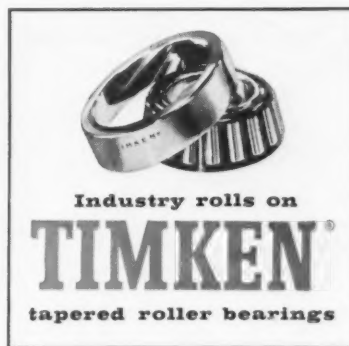
On your own bearing applications, you'll find that Timken bearings assure minimum maintenance, long bearing life because: 1) They hold shafts concentric with housings, making closures more effective in keeping lubricant *in*, dirt *out*. 2) The tapered construction of Timken bearings lets them take radial and thrust loads in any combination.



ENGINEERING SERVICE FOR THE ASKING. Let our Timken bearing salesmen—graduate engineers—tackle your bearing problems, solve them in a hurry. Save *you* time and money.



ROLLS FOREVER IN PERFECT CIRCLE on oscillating table, proving the accuracy of its taper. Another demonstration of Timken bearings' precision manufacture that assures trouble-free performance.



The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO." *Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits.* Canadian Division: Canadian Timken, St. Thomas, Ont.



PROTECT YOURSELF AGAINST THIS HAZARD with the **JOY** *Electronic Sentry**

Of the 28 mine fires in northern West Virginia in the last 10 years, no less than 12 were caused by electrical short circuits on equipment. It is for protection against hazards like this that JOY's *Electronic Sentry* was designed.

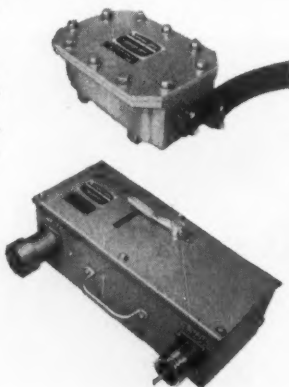
This automatic monitoring device for AC and DC operated mining machines cuts off power to the machine and its trailing cable the moment trouble occurs. *The Electronic Sentry* requires no grounding conductor, permits use of lower cost 2-conductor cable and more of it to increase operating flexibility and distance, eliminates destructive arcing from heavy fault currents.

Eliminate the cause of many mine fires by specifying the JOY *Electronic Sentry* for your power supply system, now. Get complete information by requesting Sentry Bulletin B74 Today!

Photograph Courtesy
U.S. Bureau of Mines

CD 1260.2

JOY.



**ELECTRICAL PRODUCTS
DIVISION**

1205 Mecklin Ave., St. Louis, Mo.
Exec. Offices, Henry W. Oliver Bldg. Pgh., Pa.

News Roundup (Continued)

Trade Pact Won't Change

Despite a nationwide rail freight rate increase, TVA will retain its special reduced freight rates on coal shipped by rail to Widows Creek Steam Plant, near Chattanooga, Tenn., as confirmed by R. A. Kampmeier of Chattanooga, assistant TVA manager for power, and Leonard Goering of Louisville, head of the L&N Railroad's coal traffic department. Both men said the TVA contract negotiated with L&N in August cannot be changed except by further negotiations. All current cost factors as well as the competitive situation were considered at the time the contract was negotiated, according to the officials. The rate hike over the country, expected to add more than \$140 million to annual railroad revenues, were authorized in mid-October by the Interstate Commerce Commission in Washington.

Mines, Companies

Kemmerer Coal Co. has announced plans to construct a coal carbonization demonstration oven at its Gunn-Quealy mine at Quealy, Wyo. Glenn E. Sorensen, president, said the carbonization oven is of the company's own design and will be part of the firm's continued research program. The process worked out by Kemmerer Coal Co. is vastly different from that being used by other carbonization projects in the west, Mr. Sorensen noted. He said the installation will make it possible to supply sizable quantities of material for test purposes.

Bituminous Output

YEAR TO DATE	PRODUCTION
Nov. 12, 1960	358,580,000
Nov. 14, 1959	352,326,000
1960 output 1.8% ahead of 1959.	
WEEK ENDING	PRODUCTION
Nov. 12, 1960	7,365,000
Nov. 14, 1959	9,025,000

Anthracite Output

YEAR TO DATE	PRODUCTION
Nov. 12, 1960	15,412,000
Nov. 14, 1959	17,731,000
1960 output 13.1% behind 1959.	
WEEK ENDING	PRODUCTION
Nov. 12, 1960	383,000
Nov. 14, 1959	463,000

DENVER

3 NEW PUMPS!

* In the past, many operators with small volume pumping problems have been forced to use larger pumps which were actually oversize for the job and were inefficient. This has resulted in reduced part life by as much as 300% and wasted horsepower in addition to less-than-expected pump performance.

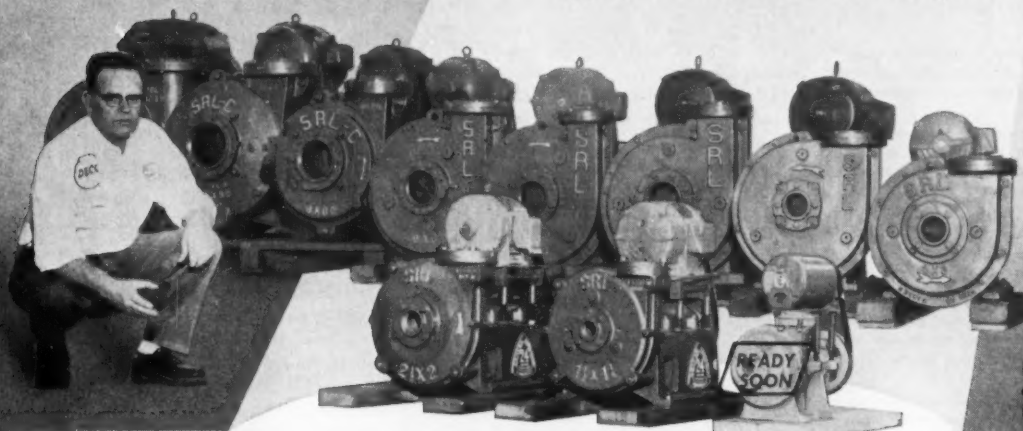
These 3 new DENVER Pumps are designed specifically to offer increased pumping efficiencies in the low gpm range.

New, small
DENVER SRL Pumps
offer high efficiency*
in low volume pumping jobs.

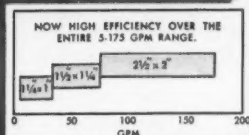
2½" x 2" for 75 to 175 GPM range

1½" x 1¼" for 35 to 75 GPM range

1¼" x 1" for 5 to 35 GPM range



DENVER SRL Pumps are now available in capacities from 5 to 3500 GPM. In stock for quick delivery.



2½" x 2"

1½" x 1¼"

1¼" x 1"



JAW CRUSHERS



STEEL - HEAD MILLS



SRL PUMPS



AGITATORS



"SUB-A" FLOTATION



DISC FILTERS



DIAPHRAGM PUMPS



AUTOMATIC SAMPLERS



DRYERS

"The firm that makes its friends happier, healthier and wealthier"



DENVER

EQUIPMENT COMPANY

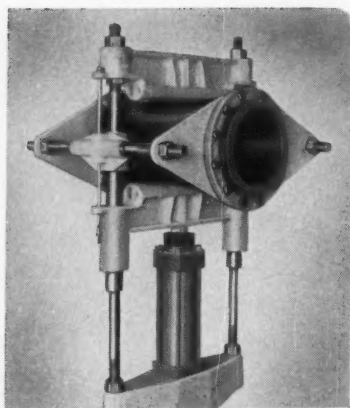
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AUTOMATED Hydral-60 PINCH VALVE SYSTEMS

Controlled circuitry for any operating requirements

- The Massco-Grigsby Hydral-60 System consists of one or more pinch valves with a single automatically operated hydraulic pump.
- Hydraulic pump may be operated by electric motor or by air from normal plant supply system.
- Valves may be the same or different size.
- Valves in the system may be operated simultaneously or independently.
- Control valve may be manual or solenoid.
- Valves may be coordinated and interlocked with other plant equipment to automatically control tank levels, rate of flow, etc.
- Valves are self-supporting and may be operated in any position from horizontal to vertical.
- Valves may be independently controlled for normal or rapid closure.
- Valves may be held fully open, fully closed, or at intermediate positions.
- Remote control to meet individual requirements.
- Controls may be included for automatic emergency operation.
- 3" to 14" I.D. sizes, with 50, 100, and 150 psi line pressure ratings.
- Temperatures to 200° F.

WRITE FOR NEW
CATALOG NO. 609

Manufacturing Division

MINE AND SMELTER SUPPLY CO.

3800 RACE STREET • DENVER, COLORADO
OFFICES AND AGENTS IN PRINCIPAL CITIES



News Roundup (Continued)

to various carbon consuming industries in the west. Construction of the unit will start immediately.

Peabody Coal Co.'s new Sunnyhill Mine No. 9 in Ohio was completed last month with a capacity of 2 million tons a year. The new mine, replacing Sunnyhill No. 8, incorporates a new preparation plant with a fluid-bed thermal drying system.

Construction began last month on a multimillion dollar coal cleaning and preparation plant at Eastern Gas & Fuel Associates' Federal No. 1 mine at Grant Town, near Fairmont, W. Va. Scheduled for completion in Dec., 1961, the new plant will have a capacity for processing 12,500 tons of coal per day. Normal operations at the mine will continue during construction. Construction of the plant marks the final stage in an improvement and expansion program at Federal. Contract for building the plant has been awarded to Roberts & Schaefer Co., Chicago.

Cannelton Coal Co. highlighted the celebration on Nov. 18 of its 50th Anniversary with an open house and a tour of its plants and newly designed offices at Cannelton, W. Va. Many prominent coal men as well as state, county and local officials attended. Cannelton Coal's history in the Kanawha Valley dates back to 1857 through predecessor companies when coal was first taken from the mines in sacks and bags. Many pictures were on display showing early Cannelton operations. It is believed that about 2 million tons of coal were mined by the previous operations from 1857 to 1910, and since 1910 Cannelton has mined in excess of 30 million tons. At the present rate of recovery, the 75 million tons of minable metallurgical and byproduct coal known to be on the property will provide employment for more than 70 yr.

Safety

Max Cook, mechanic at Bradford No. 1 Mine of Hanna Coal Co., Cadiz, Ohio, was this year's lucky winner of a new Chevrolet sedan, awarded each year to a member of the United Mine Workers of America who worked the entire year without a lost-time accident. Bradford No. 1 Mine copped the coveted "Liv Ireland Safety Trophy" for the surface operations with a zero accident frequency. It was the second consecutive year the Bradford men were presented the trophy. The underground trophy went to Glen Castle No. 6 Mine for achieving a 7.25 accident frequency rating. R. L. Ireland, James Hyslop and

James Reilly congratulated the winners on their safety records. Mr. Ireland announced that next year a new trophy, the "Liv Ireland Plaque," would be presented to each operation completing

Equipment Approvals

Jeffrey Mfg. Co. — Type ML-81A crawler-loader; five motors, four 20 hp and one 4 hp, 440-V, AC. Approval 2F-1583A, Oct. 3.

Getman Brothers — Model KD-5 diesel ore carrier powered by Deutz Model F6L/714 aircooled diesel engine, for use in noncoal mines. Approval 24-33, Oct. 4.

Freeman Coal Mining Corp.—Type 10SC-1XE rebuilt Joy shuttle car; five motors, three 10 hp and two 5 hp, 250-V, DC. Approval 2F-1584, Oct. 6.

International Harvester Co.—Model TD-6, 62 series, diesel crawler tractor with Drott 6K-3MS mining special skid shovel, for use in noncoal mines. Approval 24-34, Oct. 6.

Goodman Mfg. Co.—Type 870-20 shuttle car; three motors, two 20 hp and one 10 hp, 415-V, AC. Approval 2F-1585A, Oct. 10.

Goodman Mfg. Co.—Type 870-21 shuttle car; three motors, two 20 hp and one 10 hp, 415-V, AC. Approval 2F-1586A, Oct. 10.

International Harvester Co.—Model TD-9, 92 series, diesel crawler tractor with Drott 9K-3 mining special skid shovel, for use in noncoal mines. Approval 24-35, Oct. 11.

Kersey Mfg. Co.—Type P-1044 battery-powered utility truck; two motors, each 10 hp, 80-V, DC. Approval 2F-1587, Oct. 11.

Goodman Mfg. Co.—Type 965C loading machine; four motors, each 21 hp, 415-V, AC. Approval 2F-1588A, Oct. 17.

Kersey Mfg. Co.—Type P-744 battery-powered utility truck; one motor, 10 hp, 80-V, DC. Approval 2F-1589, Oct. 18.

Acme Machinery Co.—Type TSHR-3 mine timber setter; one motor, 50 hp, 250-V, DC. Approval 2F-1590, Oct. 20.



FALK Motoreducers driving log conveyor and refuse conveyor at the modern mill of The Bohemia Lumber Company, Culp Creek, Oregon.

FALK all-steel Motoreducers give you longer service life

Whether your load conditions are normal or heavy, the extra rigidity of all-steel construction (more than twice that of cast iron) maintains better alignment of revolving elements under load...a vital factor in prolonging the service life of gears and bearings.

And if your installations are subject to shock loads, or accidental external impacts, you're way ahead when you install Falk All-Steel Motoreducers. These rugged units do not destroy themselves by tearing off their feet under jamming overloads, nor are their housings subject to cracks which both dissipate the vital lubricant supply and allow revolving elements to get out of alignment.

All-steel construction is one of the built-in extras that you get in Falk Motoreducers. Others include: (1) inherently stronger gear teeth (by AGMA standards), thanks to exclusive Falk extra-depth, high pressure angle helical gears; (2) maximum mechanical efficiency (98½% per gear mesh, under full load); (3) your choice of standard units (horizontal, vertical or right angle) to fit your precise requirements.

HORSEPOWER RANGE: to 75 hp . . . **STANDARD OUTPUT SPEEDS:** 780 rpm (high) to 1.2 rpm (low).

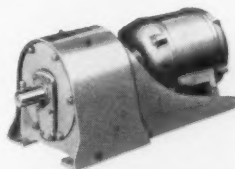
Prompt delivery from distributor stocks, or from warehouse or factory. Ask your Falk Representative or Authorized Falk Distributor for **Bulletin 3100**.

THE FALK CORPORATION, MILWAUKEE 1, WIS.

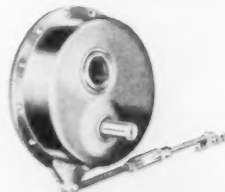
MANUFACTURERS OF QUALITY GEAR DRIVES AND FLEXIBLE SHAFT COUPLINGS

Representatives and Distributors in most principal cities

Take your choice of all-steel drives when you specify Falk



THE FALK ALL-MOTOR MOTOREDUCER
...the original All-Motor unit



THE ALL-STEEL FALK SHAFT MOUNTED DRIVE

Torque ratings to 44,000 lb-in at low speed shaft. Also available in flange-mount design.

FALK

... a good name
in industry

FALK and ALL-MOTOR are
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YOU GET MORE...

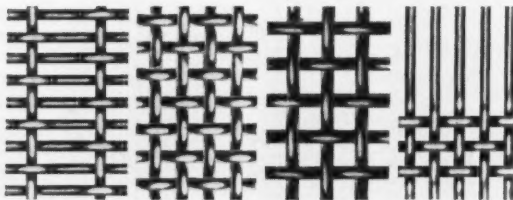
LONGER SERVICE Harder, more ductile wire—extreme care in weaving, tight, rigid, accurate—precision finishing, leveling, hook strip application—gives you much more in durability.

INCREASED PRODUCTION Exceptional accuracy allows tighter tensioning on machines, promises exceptional resistance to abrasion, breakage, distortion, sagging—cuts downtime—increases feed across the screen—reduces plant-clogging re-circulating loads—simplifies meeting tough product specifications—produces uniformly higher quality products.

GREATER ECONOMY In addition to the savings in downtime and service labor, replacement screen cost can be trimmed as much as half. Surprisingly, L-S Screens are priced competitively. Be sure to order them by name.

**LUDLOW
-SAYLOR
WOVEN WIRE SCREENS**

**IMMEDIATE SHIPMENT—most weaves and sizes
ASK FOR NEW CATALOG 104**



... Ludlow-Saylor Screens and Wire Cloth can be furnished in any steel including SUPERLOY high carbon, LUDLOY oil-tempered, stainless or other alloys; Monel, bronze, copper, brass and most other metals that can be drawn into wire.

FOUNDED 1856

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LOS ANGELES Star Wire Screen & Iron Works, Inc. (L-S Subsidiary), 2515 San Fernando Rd.
BIRMINGHAM 512 N. 18th St. **CHICAGO** 6261 West Grand Ave. **DENVER** 1530 Carr St.
PITTSBURGH Union Trust Bldg. **HOUSTON** 5638 Harvey Wilson Dr.

News Roundup (Continued)

the year without a lost-time accident and achieving a zero frequency. Such a plaque is necessary, he said, because as was the case this year, another operation—the Central Machine Shop—maintained an accident-free record but did not qualify for the trophy because of working less man-hours than the winner.

U. S. Bureau of Mines research has confirmed that the addition of from 10 to 20% ordinary salt to "permissible" explosives used in coal mines increases their safety factor. A recent Bureau report describes its studies which revealed effects of varying proportions of fine and coarse salt in cooling the flames emitted by explosives, thus lessening their chances of igniting gas or coal dust. Fine salt is said to be more effective than coarse salt. As a result of the research, undertaken in cooperation with the Institute of Makers of Explosives, one major U. S. manufacturer already has changed his formulas, adding 10% fine salt to his entire line of permissible explosives. It is expected that eventually all makers of permissible explosives will adopt salt formulas. For further information, Report of Investigations 5683, "Reducing the Incendivity of Permissible Explosives by Sodium Chloride," can be obtained from the Publications-Distribution Section, Bureau of Mines, 4800 Forbes Ave., Pittsburgh 13, Pa.

Preparation Facilities

Clinchfield Coal Co., Moss No. 3 mine, Clinchfield, Va.—Contract closed with Link-Belt Co. for refuse filter addition to handle 50 tph of 28x0 coal.

Southern Electric Generating Co., Birmingham, Ala.—Contract closed with Jeffrey Mfg. Co. for a 7-ft 2-comp't, 5-cell Baum jig to handle 316 tph of 4x0 coal.

Johnstown Coal Co., Nettie, W. Va.—Contract closed with Eimco Corp. for one 40-ft-dia thickener. Prime contractor is Kanawha Mfg. Co.

Russell Coal Co., Lebanon, Va.—Contract closed with Fuel Process Co. for raw coal vibrating screen, raw coal conveyor, 40-in Belknap duplex angle type calcium chloride coal washer, dewatering screens, calcium chloride recovery system, storage tanks and piping. Plant will handle 40 tph of 3x% coal.

Clinchfield Coal Co., Moss No. 3, Dante, Russell County, Va.—Contract closed with Peterson Filters & Enggr. Co. for a 12-ft-6x14 Dual Guide disc filter to handle 75 to 100 tph of coal refuse.

JEFFREY is in your backyard with on-the-spot service

A network of eight strategically located warehouses insures immediate shipment of service parts. All replacement parts are duplicates of the original-engineering specifications, material, processing and manufacturing.

Jeffrey's complete service starts with system engineering — continues with proper demonstration of new equipment — technical assistance to maintain operating efficiency and service parts to prevent costly outages and insure maximum performance. Give this service an opportunity to work for you.

Jeffrey's network of warehouses in the mining areas shown provides more than 25,000 different service items for immediate delivery. For full information on Jeffrey equipment call or write The Jeffrey Manufacturing Company, 912 North Fourth Street, Columbus 16, Ohio.



WAREHOUSE LOCATIONS — Birmingham, Ala.; Gilbert, Morgantown, Beckley, West Virginia; Evansville, Indiana; Harlan, Kentucky; Johnstown, Pennsylvania; Columbus, Ohio.



◀ This Jeffrey field service engineer is one of our factory trained field service group constantly providing on-the-spot technical assistance. Here he is checking adjustments on a shuttle car at mine portal preparatory to start on production.



JEFFREY

MINING • CONVEYING • PROCESSING EQUIPMENT...
TRANSMISSION MACHINERY... CONTRACT MANUFACTURING



MOUTHFULS UP TO 100 TONS. The Midland shovel—one of the world's largest electric shovels—is shown removing overburden at the Midland Collieries, Inc. open-pit mine at Victoria, Illinois. Raw coal is then picked up by smaller shovel, and shipped to terminal points for processing, before being sent to industrial and electric-utility users in Illinois and Iowa.

CABLE'BILITY at work

Okocord gives
Midland giant
its "bite"

Cable'bility (cā'ble·bil'·i·ty) *new word.*
Noun. 1. Ability to design and manufacture electrical cables that give outstanding performance. 2. Having long background and wide experience in cable research and application. 3. Possessing keen understanding of customers' problems. Implies eagerness to serve faithfully and dedication to progress. **Syn.** The Okonite Company.

It's giant, all right. A shovel as tall as a 14-story building . . . weighing 2900 tons . . . capable of gobbling up 70 cubic yards of earth and rock at every bite. And its giant appetite for power—at 7200 volts every second of every day—is supplied by tough, flexible Okocord cable.

The shovel is one of the five largest power shovels in the world. Owned by Midland Collieries, Inc., and operated at their open-pit mine in Victoria, Illinois, it strips away soil, shale and rock to expose the coal bed 50 feet below the surface. Snaking behind it is the 1000-foot Okocord lifeline that connects the giant's motors to a terminal box on the surface.

Midland Superintendent Charles German sums up what he desires in a cable in one word: "Durability." Each day the cable is twisted, scraped across coal deposits, exposed to heat and dampness—without downtime.

What Okocord does for the Midland shovel, it can do for *your* machines, large or small. Okocord's durability—the result of its toughness and flexibility combined with excellent resistance to moisture, heat and corona-cutting—makes it a wise investment for trouble-free mining operations. This is Cable'bility. For complete details write for Bulletin CA-1108. The Okonite Company, Subsidiary of Kennecott Copper Corporation, Passaic, N. J.



where there's electrical power...there's **OKONITE CABLE**

"RATIO-FEEDER" ^{*}saves us 20 seconds in the unloading of each shuttle car...

we have found your Ratio-Feeder to be a very valuable piece of machinery in our Thunderbird Mine," says WILBUR A. ENDICOTT, General Superintendent, Ayrshire Collieries Corp.



1. Shuttle car unloads at its maximum discharge rate into a Ratio-Feeder in Ayrshire's Thunderbird Mine. The 20 seconds saved increases mine output...extends shuttle car haul distance...lowers cost per ton.



2. "The wide intake conveyor of the Ratio-Feeder takes the full load of the shuttle car with a minimum of spillage and holds down clean up costs," General Superintendent Endicott reports.



3. Ratio-Feeder discharges at a uniform rate reducing belt overloading, damage and wear. "It can be set to proportion the coal so that several panels can unload onto the same belt without stopping any one of the others," says Mr. Endicott.



4. Ready for the next shuttle car. This Ratio-Feeder was installed in September 1959, had handled 250,000 tons of coal when picture was taken 6 months later. Two more Ratio-Feeders have since been installed in the Thunderbird Mine.

The Ratio-Feeder is now demonstrating in mine after mine that it is the answer to the age-old problem of getting coal from a shuttle car to a belt...*fast*...without damage to the belt...increasing belt haulage capacity...and with a minimum of spillage. The advantages that Ayrshire Collieries and other well-known mines are getting from the Ratio-Feeder can be yours too. It will cost you nothing at all to get the complete *proved* facts as to where this time-saving machine is working and what it is accomplishing...and what it can do for you. Simply write or call us.



Ratio-Feeders are now available in six standard models with capacities from 2 1/4 to 15 tons.

COLOR MOVIE. See the Ratio-Feeder at work in a mine. Ask to have us show you this film at your office.

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for
bulletin



COLUMBUS McKINNON CORPORATION
Mining Equipment Division

53 FREMONT AVENUE, TONAWANDA, NEW YORK
Manufacturers of CM HOISTS, CHAIN AND CONVEYORS
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DISTRIBUTED BY: Carlsbad Supply Co., National Equipment Co., J. L. Thomas Co., J. Schonthal & Associates, Inc., Schroeder Brothers Corp.

*Economy never came
in such a choice!*

NEW FORD TRUCKS

FOR 1961

619 NEW MODELS! All engineered with one idea in mind...economy! New "Big Six" engine for 2-tonners plus five Cummins diesels for the new H-Series tractors expand the proven line of Ford engines to 18—with one just right for your job. A wider-than-ever choice of transmissions and axles. And...on all 1961 Ford Trucks, each part, except tires and tubes, is now warranted by your dealer against defects in material and workmanship for 12 months or 12,000 miles, whichever occurs first. The warranty does not apply, of course, to normal maintenance service or to the replacement in normal maintenance of parts such as filters, spark plugs and ignition points.

FORD TRUCKS COST LESS

YOUR FORD DEALER'S "CERTIFIED
ECONOMY BOOK" PROVES IT FOR SURE!

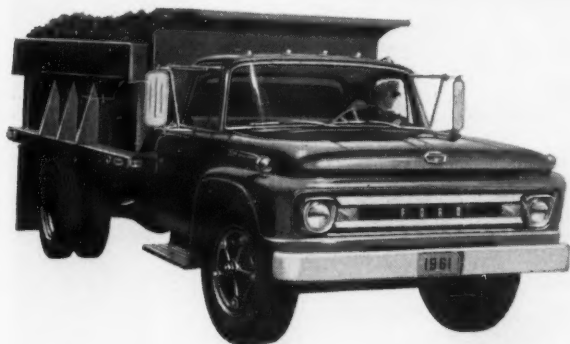


New! Durable Tandems

Ford's Tandem Axle trucks for '61 are engineered to give you greater flexibility and significant payload advancements. Your choice of 22,000-lb., 28,000-lb., 30,000-lb., 34,000-lb., or 38,000-lb. axle capacity. New, longer wheelbases are available to permit installation of special bodies up to 21 feet long. Aluminum walking beams as well as aluminum wheels and gas tanks are optional for reduced chassis weights.

FORD DIVISION, *Ford Motor Company*,

December, 1960 • COAL AGE



New! "Big Six" Engine

More power for America's savingest 2-ton trucks . . . a big 262-cu. in. Six with the performance of big displacement, the durability of heavy-duty construction, plus the gas economy of 6-cylinder design! Available early 1961. You also get improved riding comfort with new smoother-acting springs and a sturdy truck suspension system that can give up to twice the front tire life of some other makes.



New! H-Series Diesel- or Gas-Powered Tractors

Ford's new H-Series tractors with 28-inch front axle setting and 82-inch BBC are offered in four single-axle and four tandem-axle models with over 500 engine-axle-transmission combinations. Choose from ten industry-accepted engines—five Cummins diesels and five Ford Super Duty V-8's!

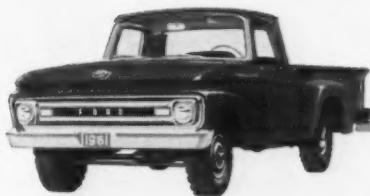
New 100,000-mile warranty on Super Duty V-8 gas engines is most liberal in the industry. On 401-, 477- and 534-cu. in. V-8's, Ford Dealers will replace any major engine part (including block, heads, crankshaft, bearings, valves, pistons, rings) found to be defective in materials and workmanship in normal on-highway use. Warranty covers full cost of replacement parts for 100,000 miles or 24 months, whichever occurs first . . . full labor costs for first year or 50,000 miles, sliding percentage scale thereafter.



NATIONWIDE SERVICE . . . look for this sign at Ford Dealers' across the country, for service on all Ford gas and diesel trucks!

New! Extra Heavies

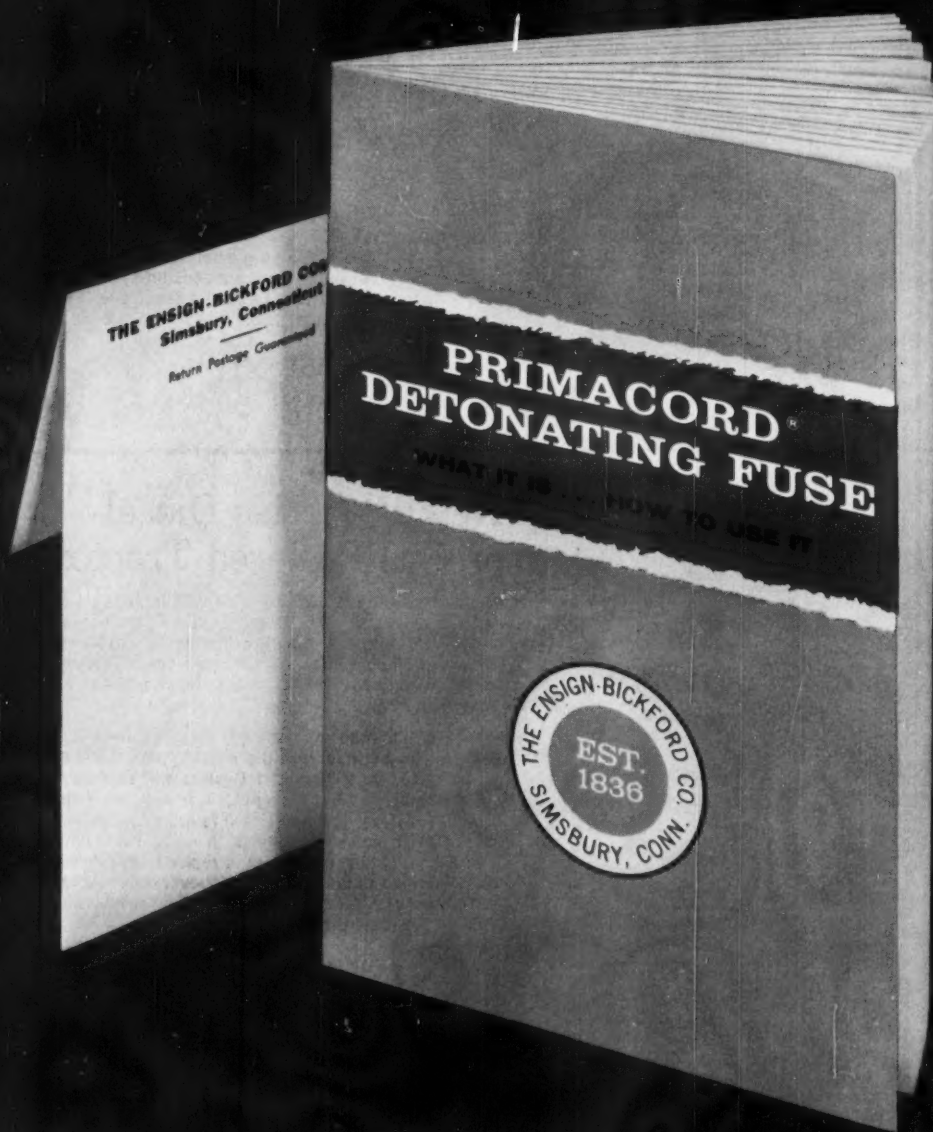
Double-channel truck frames and single-channel frames of high-tensile steel for tractor models give proper strength with minimum weight. Wider power train choice, 28-inch front axle setting plus new high-durability cabs and sheet metal mean greater earning power for you.



New! 4-Wheel Drive Pickups

Ford offers the lowest-priced* 4 x 4 with big 8-ft. box. And these models have the traction to go most anywhere . . . road or no road! You can choose either the gas-saving 135-hp Six or the 160-hp V-8 that gives extra power with "six-like" economy.

*Based on a comparison of latest manufacturers' suggested retail delivered prices



New PRIMACORD® BOOK is a catalog and field manual which illustrates and describes standard Primacord brands and tells how to use this detonating fuse to obtain better blasting with greater safety and profit—in mining, quarrying and construction work.

Ask your explosives supplier for a free copy or write to Sales Department

THE ENSIGN-BICKFORD COMPANY
Simsbury, Connecticut Since 1836

P-6

Devoted to the Operating, Technical and Business Problems of
The Coal-Mining Industry

**COAL
AGE**

DECEMBER, 1960

IVAN A. GIVEN, EDITOR

More of the Same

Now that it is certain that the next president of these United States will be a Democrat, perhaps a little guessing can be done as to the business climate in the next administration and what it will mean to coal. Had the election gone the other way one thing still would have been certain: the tendency would have been toward more spending, since that is one way a new man can begin to make a record in preparation for the next race. The Republicans and Nixon were conservative in their approach to spending, but the Democrats and Kennedy were pledged to building up the power of the federal establishment and the spending of more and more money both here and abroad; to more federal exploitation of natural resources; and greater liberalization in trade and other relations with foreign countries.

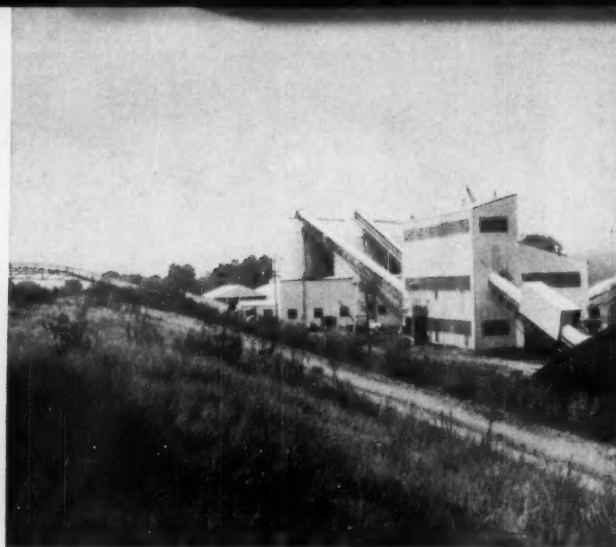
Nothing like a runaway situation need be expected however, first because Kennedy and his administration must of necessity exercise some restraint. Then there is Congress.

But business may find a little more coolness in the Washington climate, a little more urge toward restriction and regulation, a little more of a trend to more federal competition, a little easier hold on the purse strings, and a greater willingness to make concessions to foreign countries in advancement of the administration's ideas for winning new allies and cementing ties with old more firmly. Thus oil import regulations may well be eased and increased imports of Canadian and Mexican natural gas may be condoned. But all in all the basic situation will not be too different. Rather it probably will be a little more of the same.

No Surprises

As the year wears on to its end it becomes more apparent that the "recession," "depression," "rolling readjustment" or what have you that the country has been experiencing will go on a while yet—many say at least for the first half of 1961, though optimistic for the record. It therefore is necessary for coal to plan on a continuation of its recession level of operation—a level, incidentally, that dropped the industry of the U.S., bituminous and anthracite together, to third place in world ranking in 1959. Germany—Communist and free together—was first, and Russia second. Russia probably made the top in 1960.

Are there any surprises—pro or con—in the future picture? None are visible at this time. Nothing radically new in competition, or even a major increase in present competition, is in the picture at this time. By the same token, no major new markets are in sight. Rather, the picture is one of steady but not spectacular growth—no ride on the merry-go-round but nevertheless a future of growing output and growing reward through increased opportunity for service.



Big shovel stripping Total washing, raw- and clean-

Banner Mine: United Electric's 4,000-

A POSITIVE APPROACH in evaluating the potential of a coal bed previously regarded as marginal or too difficult to mine at a profit led to development of Banner mine—Illinois' first modern strip mine loading coal directly from plant to barges.

Newest venture of the United Electric Coal Cos. which pioneered all-water shipment to Great Lakes Ports, Banner mine is strategically located on the Illinois River near Banner, Peoria County, Ill. The operation taps an 18-million-ton proven reserve of Illinois No. 2 coal. Although seam thickness averages only 28 in and average stripping ratio is 18:1, the superior quality of the coal offsets these disadvantages. For instance, a typical clean coal analysis is as follows: 5% ash, 2½ to 3% sulphur and 12,000 Btu.

With mine capacity at 4,000 tpd, Banner produces washed coal in commercial tonnages never before available from the No. 2 seam. Although the mine has been producing less than a year, the coal has been so well received that United Electric expects to increase output to meet the growing demand. Banner coal is being sold in midwestern markets where the regular grades of Fulton County coals have been found unsuitable. After being loaded directly from the plant into barges, most of the Banner coal moves north on the Illinois River to the Chicago area. It then is transshipped directly from the barges to boat for lake shipment.

Raw-coal handling and preparation facilities were designed and built by Roberts & Schaefer Company. The river piling and erection of much of the dock structure was handled by

Dravo Corp. The plant is sheathed with Strand steel panels and has Strandolite green fiberglass panels in place of windows.

A Bucyrus-Erie 1050B electric shovel that takes a 45-cu yd bite of overburden every 55 sec is the backbone of Banner mining operations. Working around the clock seven days a week, the 45-yd shovel removes well over 1,000,000 cu yd of overburden per month.

Trucks haul raw coal to a 100-ton surge bin near the preparation plant. It then travels by belt conveyor to a crusher for reduction to 6x0 before delivery to a 5,000-ton storage pile. These raw-coal handling facilities prevent delays in truck traffic between the pit and plant and make possible continuous operation of the preparation plant.

Coarse coal is washed in a Dutch States Mines heavy-media vessel and may be crushed and rescreened into special domestic and industrial stoker sizes. Fine coal is cleaned in a hydro-tator.

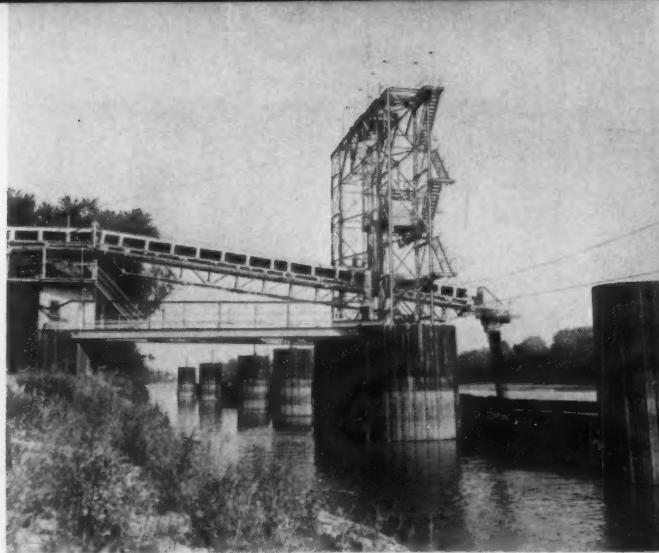
Washed and sized clean coal travels to three storage bins, two of which hold 1,000 tons and the third 1,500 tons. From these bins, coal feeds to a 600-ft belt leading to the river loading station.

Developing the Property

To keep pace with the demands



UNITED ELECTRIC PROPERTIES are strategically located on or near water transportation leading to the Great Lakes.



coal storage Direct loading into barges at . . .

Tpd On-River Producer of Illinois Coal

of public utilities and industry for larger tonnages of coal, United Electric has continually been expanding its production and marketing services. In its search for new opportunities, several years ago, United Electric management became interested in the coal tapped by Banner.

Over the previous 10 to 15 yr a number of other coal operators had investigated the property but had rejected it because of what they considered adverse conditions. For instance, the coal seam is 30 ft below the elevation of the Illinois River and lies under an old lake and flood area; it is only 28 in thick; the overburden ratio is comparatively high; and surface water is a major problem.

But United Electric management examined the property from a positive viewpoint, noting these advantages: the coal was adjacent to a navigable river; could be transported all the way to markets by water; modern preparation methods could upgrade the coal to premium quality; and inflow of surface water could be handled by planned ditching and pumping.

Although confident that the Banner property offered an unusual opportunity, United Electric management made a thorough study of the raw and washed coal before making final plans for developing the mine.



OFFICIALS include R. H. Inman (left), mining engineer; R. F. Donaldson, Banner superintendent and R. J. Hepburn, vice president, operations.

Banner Officials

R. F. Donaldson, superintendent
Dale Burkhalter, preparation engineer
A. H. Seeling, pit foreman, master mechanic
Oscar Ernst, chief electrician
Charles Hook, preparation plant foreman
Ivan Berry, analyst
J. C. Morris, chief clerk

For example, 2 yr before actual development started the company opened a test pit and trucked the coal 15 mi to its Buckheart mine. There it was washed in a heavy-media vessel and the clean product shipped for testing in every conceivable type of burning equipment. The coal passed all tests and was well received. As a result, United Electric decided to open the multi-million-dollar Banner property.

Uncovering the Coal

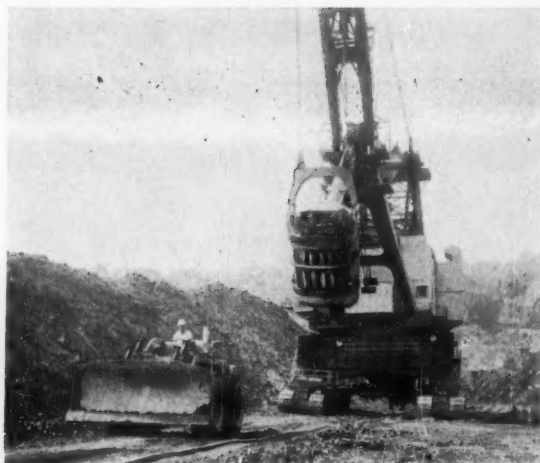
The 1050B shovel cuts a 100-ft swath through shale and dirt overburden that ranges from 15 to 85 ft in thickness. At the present time the big stripper digs the overburden without the aid of explosives.

Working with the 45-yd shovel as auxiliary machines are a rubber-mounted Caterpillar 966 Traxcavator equipped with a dozer blade, two Caterpillar D8 bulldozers and 5½-yd Manitowoc 4500 diesel dragline. The Traxcavator shuttles back and forth between the stripping and loading shovels performing cleanup work for each unit. The two D8 dozers mainly work on the highwall ahead of the stripping shovel clearing timber. They also do light ditching. The Manitowoc 4500 digs and maintains the ditches which divert surface water from the pit to the main sump.

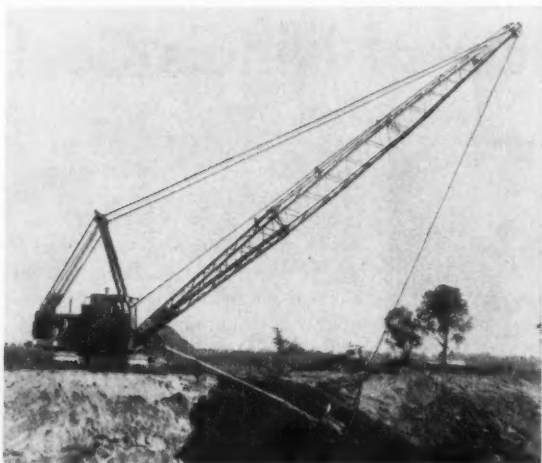
Banner also has a 3-yd Manitowoc



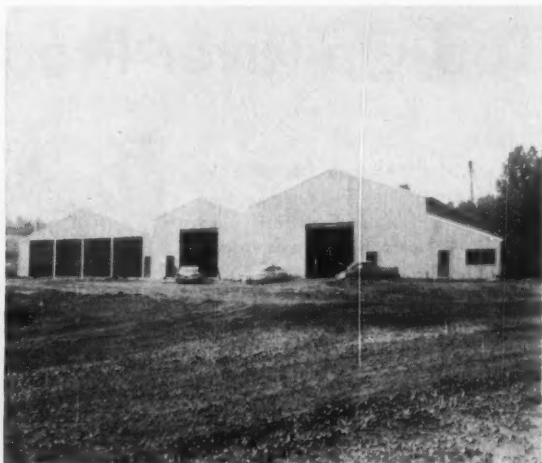
COAL SHOVEL had 5-yd dipper altered for easier loading of thin 28-in seam. Fleet of 20-ton trucks hauls coal to plant.



RUBBER-TIRED UTILITY UNIT equipped with bulldozer blade does clean up work in the stripping and loading pits.



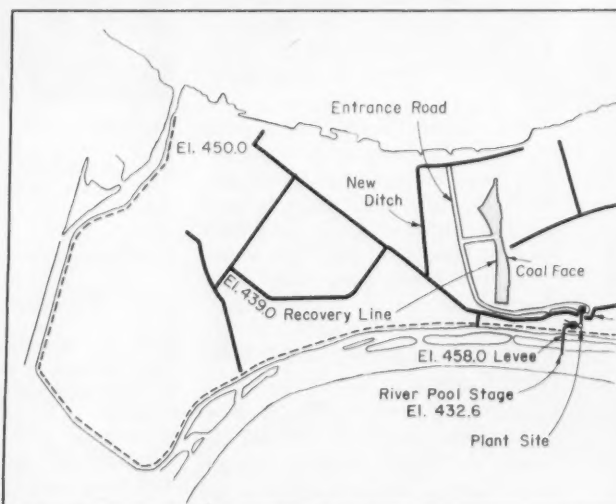
DRAGLINE digs and maintains the network of drainage ditches which are vital to water control at Banner mine.



PREFABRICATED steel buildings are combined into garage, warehouse, office and washhouse in this service center.



FARM TRACTOR enables one man to service and move pit pumps and aluminum pipelines to points of greatest need.



CONTROLLED DRAINAGE of old flood and lake area is vital to successful mining at Banner. Coal is 30 ft below the

3500 diesel shovel available for coal loading when the 45-yd shovel is in thin cover at one end of the pit. The 3-yd shovel not only eliminates the need for two-shift loading but also provides a utility unit.

The upper 16 ft of overburden is silt which slides when it is water logged. To prevent slides from coming into the pit, Banner uses a special stripping procedure. The big 45-yd shovel scoops off the silt layer, casting it as far as possible on the spoil bank. Rock in the lower portion of the overburden then is placed against the toe of the silt spoil to form a "buckwall". This rock wall provides enough support to prevent silt slides.

Loading and Hauling

A Bucyrus-Erie 85B shovel with a 5-yd dipper loads coal into a fleet of six 20-ton semitrailers which travel over company roads to the storage bin at the preparation plant. To simplify loading in the thin seam, the company has adjusted the dipper on the coal shovel. The loading shovel works only on the day shift.

Controlling Surface Water

The Banner pit is 30 ft below river level and for this reason water control receives careful attention. Although a levee protects the property against flooding by the Illinois River, surface water in the former lake and flood area now being stripped must

be controlled by large ditches and high-capacity pumps.

The mine is in the Banner drainage district which includes a 17-mi network of large ditches leading to a large centrally located sump. Two pumps capable of handling 37,000 gpm transfer water from the sump to the Illinois River. In emphasizing the importance of water control, Banner management notes that these two pumps operate for as long as 100 to 150 hr after a heavy rain. To maintain this vital drainage network as stripping progresses, the company digs temporary ditches when one of the permanent ditches must be crossed. The permanent ditch is redug as soon as stripping passes the area. In addition to the ditching system, Banner has a group of strategically located portable pumps to control pit water. Both skid- and wheel-mounted Morris and Jaeger units are available for pit dewatering. To simplify moving and installation, all suction and discharge lines are laid with 6-in aluminum pipe joined with quick-closing couplings. One man, with the aid of a Ford farm tractor, services all pit pumps and moves them to new locations. All pit pumps are driven with 440-V AC motors which receive power from a skid-mounted transformer.

Stockpiling Raw Coal

Trucks discharge raw coal into a 100-ton surge hopper near the prep-

aration plant. Two 48-in adjustable reciprocating feeders then transfer coal to a 48-in Jeffrey conveyor for delivery to a Jeffrey 36x45 primary crusher. After reduction to 6-in top size, the crushed coal flows to a 30-in belt leading to a lowering chute in the raw-coal storage area. This area holds 2,000 tons in live storage and space is available to store 5,000 tons.

Two adjustable 36-in reciprocating feeders equipped with Reeves drives deliver coal to a second belt leading to the top of the preparation plant. As the coal travels to the plant a Merrick belt scale records the weight. Belt conveyors are equipped with U. S. Rubber and Goodrich belting. Inside the plant an Allis-Chalmers 7x16-ft double-deck Ripl-Flo vibrator splits the raw feed into 6x1½, 1½x¾ and ¾x0 fractions.

Cleaning the Coal

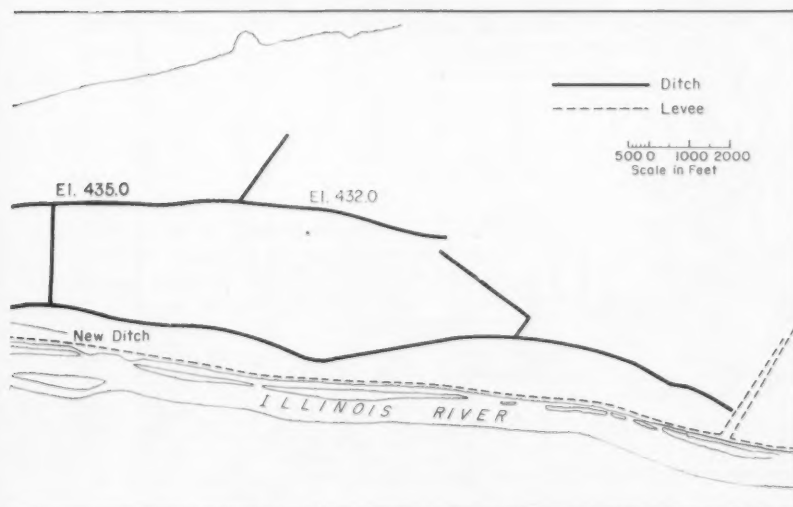
The 6x¾ fraction flows to a Dutch States Mines heavy-media vessel at the rate of 260 tph. Clean coal discharges onto two Allis-Chalmers 6x12-ft Low-Head double-deck rinsing, dewatering and sizing screens equipped with Ludlow-Saylor screens for separation at ¾ in. The 6x7½ product passes to a Gundlach two-stage adjustable crusher for reduction to either 1½x0 or ¾x0.

A flight conveyor transports the crushed coal to an Allis-Chalmers 8x16-ft Ripl-Flo vibrator for separation at ¾ and ¼ in. When the coal is crushed to 1½x0 the screen products are 1½x¾, ¾x¾ and ¾x0. Each size travels to a steel storage bin on a separate Jeffrey belt conveyor. The 1½x¾ is stored in a 1,500-ton bin and the two smaller sizes are stored in 1,000-ton bins.

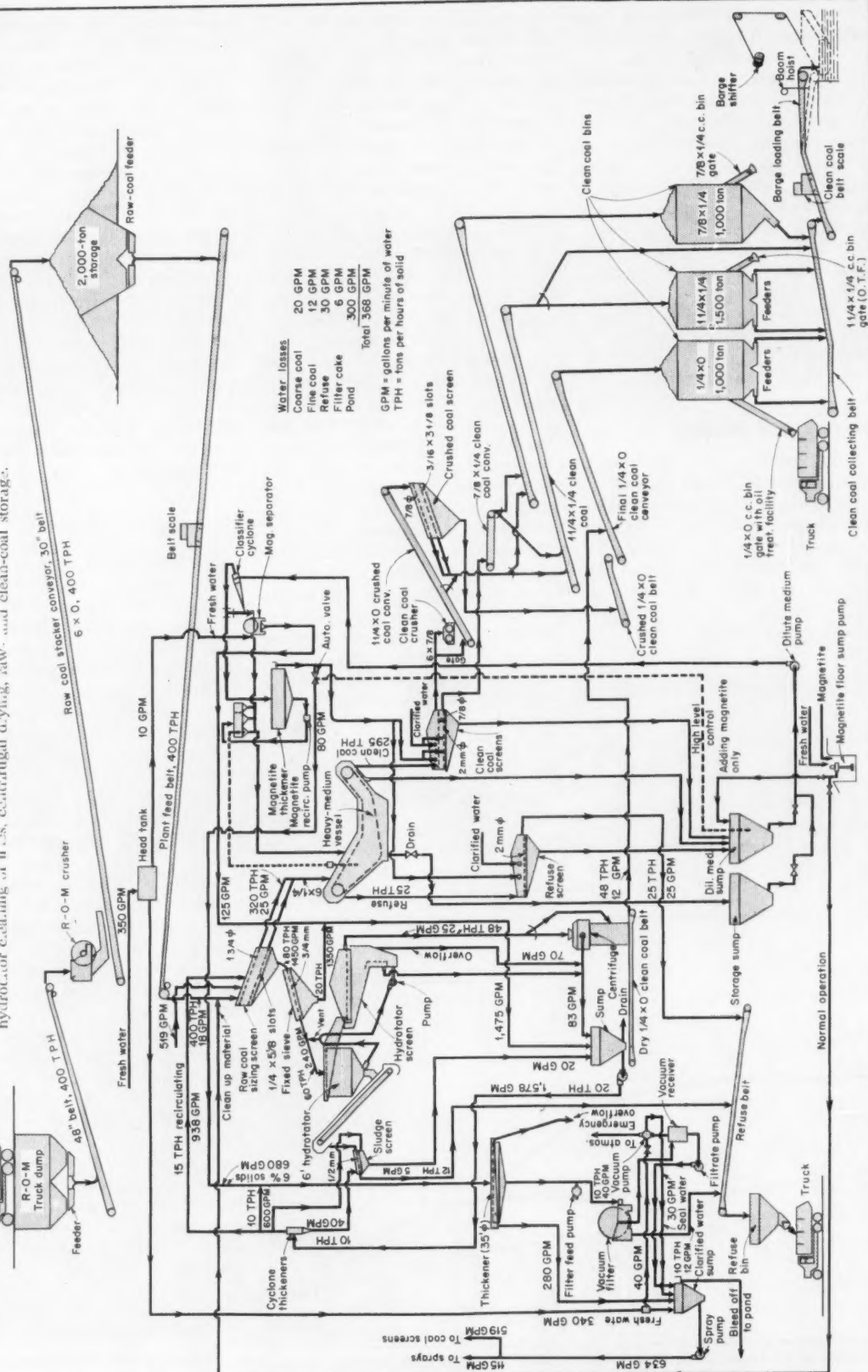
Fine ¾x0 from the raw-coal vibrator flows to a Roberts & Schaefer hydrotator for separation into clean coal and refuse. The clean product passes to an Allis-Chalmers 5x16-ft Low-Head vibrator equipped with a Bixby-Zimmer ½-mm screen cloth for dewatering. The dewatered product then flows to a CMI centrifugal dryer for final dewatering and delivery to a belt conveyor leading to a 1,000-ton storage bin.

Magnetite Recovery

Underflow from the primary sizing, dewatering and refuse screens passes



elevation of the Illinois River. A levee protects the mine from river flooding, but surface water must be controlled by large ditches and pumps.

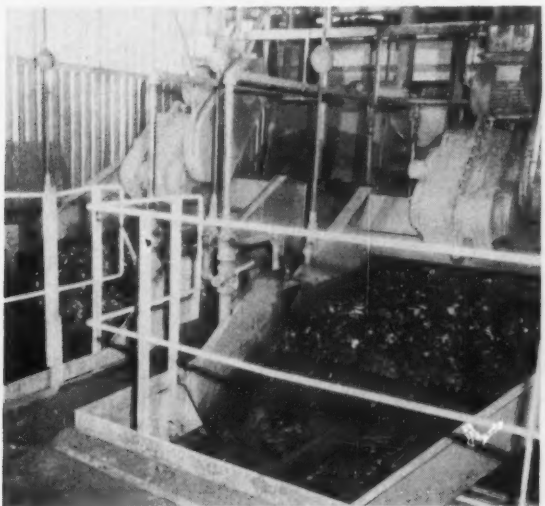




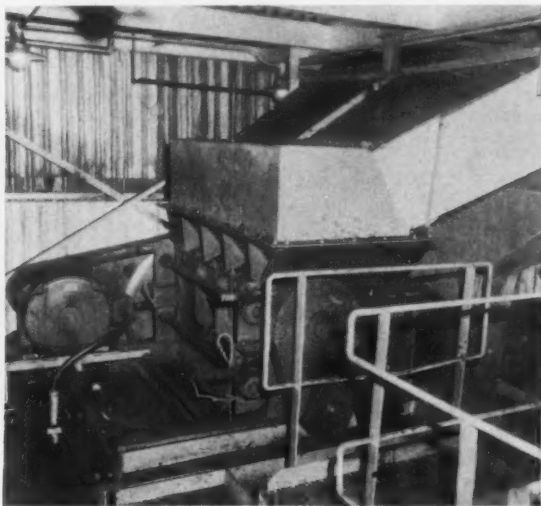
BELT SCALE weighs and totalizes volume of raw coal as it travels from the stockpile to the preparation plant.



HEAVY-MEDIUM WASHER processes 260 tph of 6x $\frac{3}{4}$ coal. Clean product is screened at $\frac{3}{8}$ in; plus $\frac{3}{8}$ -in may be crushed.



RINSING, dewatering and sizing of clean coal are achieved on two 6x12-ft, double-deck vibrators.



TWO-STAGE CRUSHER reduces clean 6x $\frac{3}{4}$ to either 1 $\frac{1}{4}$ x0 or $\frac{3}{8}$ x0 which are then rescreened at $\frac{3}{8}$ and $\frac{1}{4}$ in.

to a dilute-medium sump. There a Morris 6CK pump picks it up and delivers it by pipeline to a Dutch States Mines cyclone which concentrates the magnetite and feeds it to a Stearns magnetic separator. Concentrated magnetite from the separator discharges into a 16-ft Eimco thickener. Thickened magnetite flows to a Dorr-Oliver ODS diaphragm pump which discharges through a needle valve arrangement. This needle valve is connected to an automatic Foxboro control unit that automatically adds the magnetite to the dense-medium washing system when the specific gravity falls below the desired value.

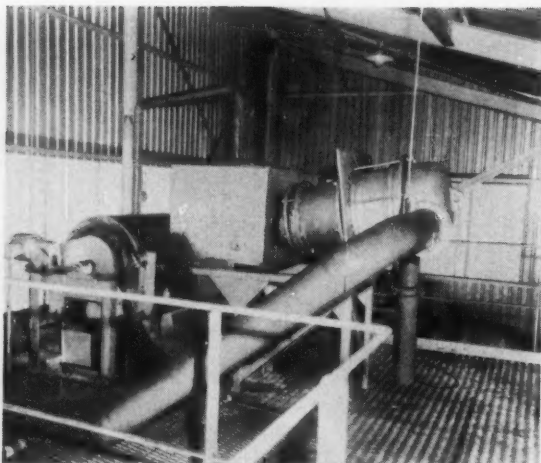
Dilute underflow from the magnetic separator flows to a sump for delivery to a battery of four Dorr-Oliver 12-in cyclones. Underflow from these cyclones is dewatered on a Meckum Engineering 3x12-ft resonance vibrator equipped with $\frac{1}{2}$ -mm screen cloth. Vibrator underflow returns to the sump feeding the 12-in cyclones and the overproduct flows to the magnetite feed circuit.

Part of the overflow from the 12-in cyclones is used for wet screening of the raw coal and about 250 gpm passes to an Eimco 35-ft static thickener. Underflow from this thickener passes to a 6-ft 4-disk Eimco filter

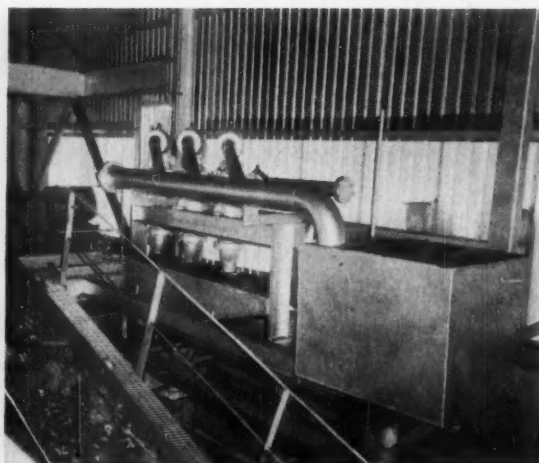
for final dewatering. The filter cake goes to the refuse circuit and the filtrate is bled to a drainage ditch. Overflow from the static thickener flows to a storage tank for use as spray water on the magnetite-recovery and clean-coal screens.

Refuse from the heavy-medium washer flows over a 3x12-ft double-deck vibrator for magnetite removal and dewatering. It then drops onto a 30-in belt that carries it to a 70-ton refuse bin. From there a 20-ton truck transports it to the spoil area where it is buried.

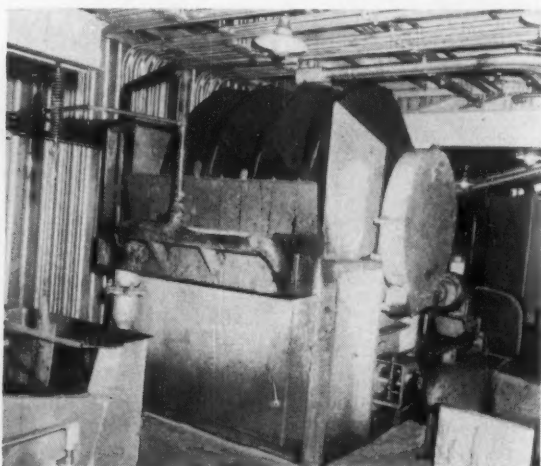
All sizes of clean coal may be treated with hot oil before delivery to the



MAGNETITE-RECOVERY SYSTEM includes cyclone feeding magnetic separator, which in turn feeds magnetite to thickener.



BATTERY of 12-in cyclones treats underflow from separator, recovering any magnetite missed in initial separation.



VACUUM FILTER removes solids from the underflow from 12-in cyclones as the last step in complete water clarification.



NEOPRENE BELT carries oil-treated coal to barges on Illinois River. Belt scale weighs and totalizes coal enroute.

barges or trucks. A Fluid Systems Thermal Electric oil-heating system, said to be the first in the coal industry, maintains oil at 150 F in the storage tanks and the pipes leading to the pressure pump. After leaving the pump, oil temperature rises to 200 F and is held at that temperature all the way to the sprays. To maintain these temperatures throughout the system, the Thermal Electric system uses heaters for the full length of the spray line. In summer Banner coal is sprayed with Standard 1,000-viscosity oil and in winter with 500-viscosity oil.

Powering the Mine

Power is delivered to the property at 33,000 V and split into two cir-

cuits, one supplying the mine and the other the preparation plant. The mine power circuit is carried along the edge of the property by a permanent poleline on the levee following the river. At the end of the poleline a General Electric 1,500-kva portable unit substation reduces voltage to 4,160 for operating stripping equipment. A 5,000-ft ground cable made up of 1,000-ft sections of Anaconda, Okonite and Simplex SHD cable, extends along the highwall. Cable sections are joined in junction boxes which provide outlets for 2/0 cables leading to an oil switch in the pit. From the oil switch, separate cables lead to the stripping and loading shovels.

Power for the preparation plant is

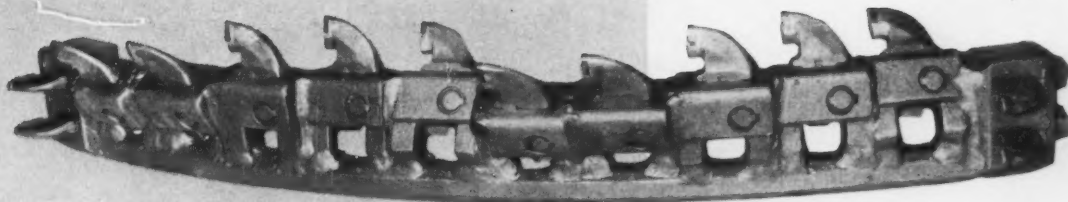
stepped down to 440 V in two stages. First a Wagner 1,500-kva reduces voltage to 4,160 and then three Allis-Chalmers 333-kva units further reduce it to 440 V. Plant controls were provided by Westinghouse.

Service Buildings

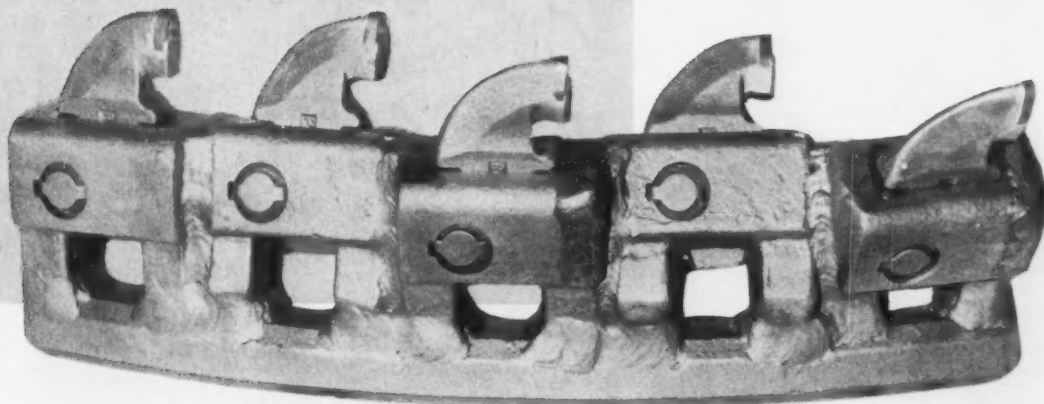
A series of Strand Steel prefabricated buildings connect together as a single structure to provide a compact service and administration center. They include a 100x120-ft garage and truck-storage area, 40x100-ft shop, 60x100-ft warehouse and 20x100-ft office and washhouse. A Fairbanks Morse scale is installed in front of the office for the convenience of truck customers.

FOR INCREASED EFFICIENCY...

**Patent Pending*



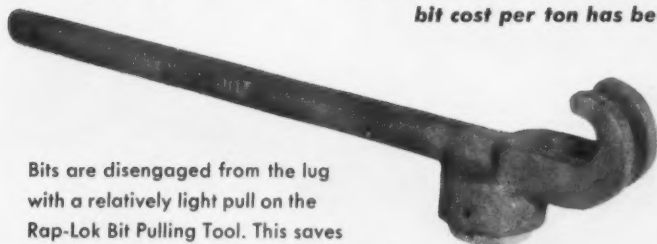
THE
CINCINNATI RAP-LOK
FOR BORING TYPE MINERS LEADS THEM ALL



Through the cooperation of "CINCINNATI MINE" and mining men throughout the industry, the Cincinnati Rap-Lok principle has now been successfully applied to the arms of boring type continuous miners. The difficulties encountered with the use of set screw type and tapered type bit mountings have been eliminated.

Operating costs have been lowered since bit setting time has been reduced as much as 75%. The overall efficiency of the machines has been improved and *bit cost per ton has been cut due to the virtual elimination of lost bits.*

**Patent Pending*

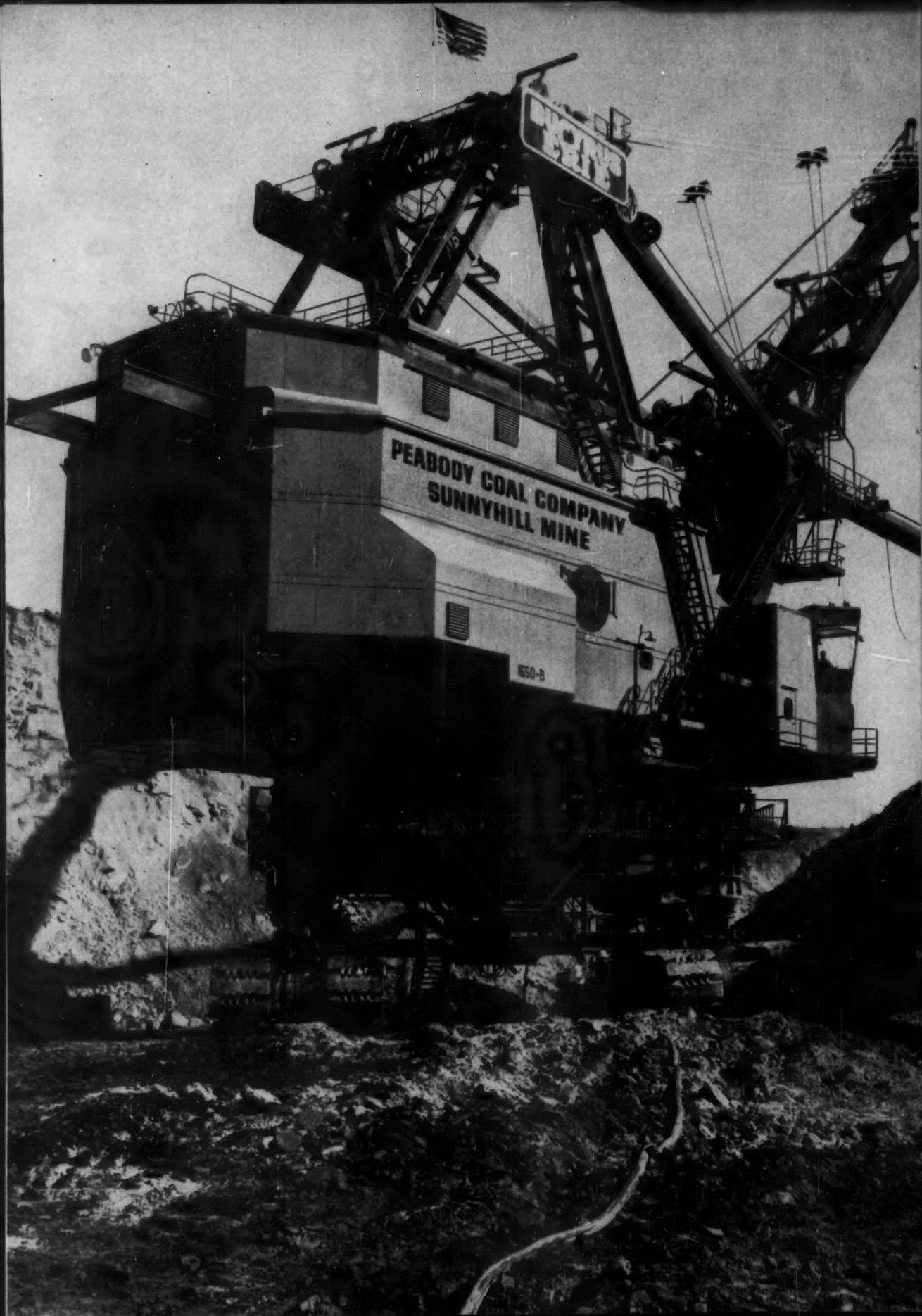


Bits are disengaged from the lug with a relatively light pull on the Rap-Lok Bit Pulling Tool. This saves time and effort. The long-lasting hammer face is easily renewable.

On boring type machines using trimmer chains the Cincinnati Rap-Lok Trimmer Chain is recommended for the ultimate in machine performance. For further details contact the Cincinnati Mine Machinery Company or one of their representatives.

THE CINCINNATI MINE MACHINERY CO.

CINCINNATI 25, OHIO



The tail that wags the dog—

Tiger Brand Amerclad Cable

This 65-cubic-yard shovel scoops overburden at the rate of 1,500,000 cubic yards a month at the Sunnyhill Mine of the Peabody Coal Company. It operates on a 6,900-volt electrical system and has a 9,000 horsepower capacity including all motors.

Power is supplied through a USS Tiger Brand Amerclad Cable. The cable takes a lot of abuse in its long run under a roadway, through a creek and over jagged rocks. It is standard 8KV three-conductor Type SH-D cable. The insulation is tough, flexible Amerzone rubber. Each conductor is shielded for safe handling with a close serving of tinned copper wires securely bound in place and supplemented by heavy copper ground conductors. Such a shield

provides the flexibility lacking in a full copper braid and avoids the break-up of the wires due to chafing at cross over points.

Ground wires, Neoprene fillers and a heavy, tough, reinforced jacket of oil resistant Amerprene complete the cable. And by providing positive clearing of the cable in case of a "short," this construction is tops in safety.

American Steel & Wire also makes Armorlokt cables, bore hole cables and a complete line of power distribution cables noted for their high quality. For complete information, write American Steel & Wire, Dept. 0485, 614 Superior Ave., N.W., Cleveland 13, Ohio, or contact our nearest distributor.

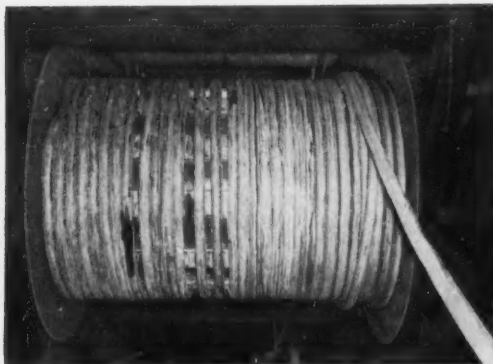
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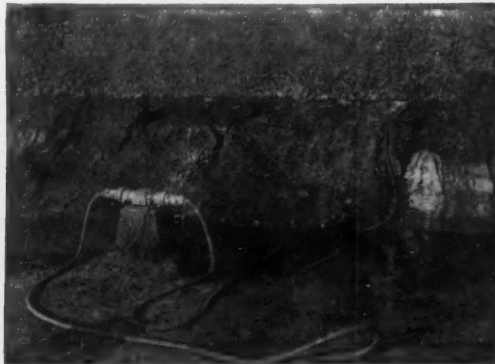
Tiger Brand Electric Wire & Cable

A standard cable for every special job

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- Special Purpose Wire & Cable
- Aerial, Underground and Submarine Cable



Greater flexibility of Amerclad permits constant reeling and unreeling.



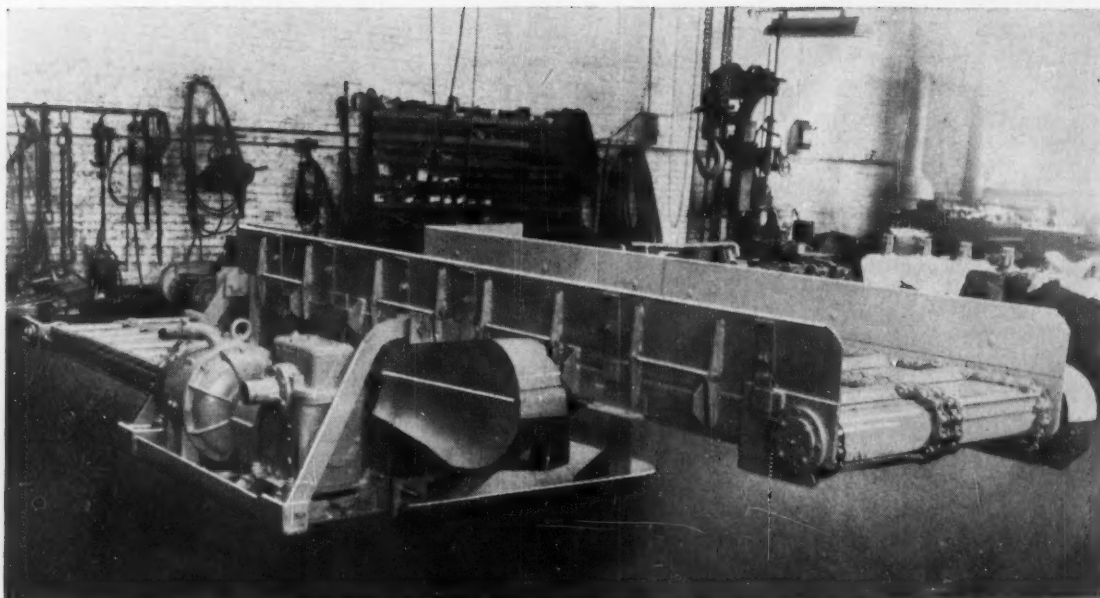
Constant exposure to mud, acid mine water, abrasion and weather doesn't harm Amerclad Cable.

◀ The tail that wags the dog. Tiger Brand Amerclad Cable (foreground) is the finest you can get for big shovel power supply.



**American Steel & Wire
Division of
United States Steel**

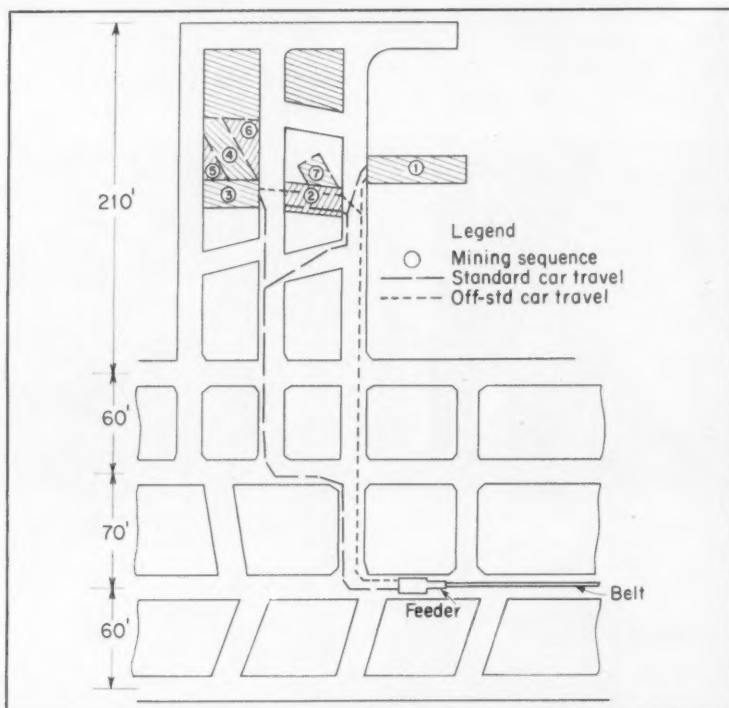
Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
Tennessee Coal & Iron Division, Fairfield, Alabama, Southern Distributors
United States Steel Export Company, Distributors Abroad



BELT FEEDER, made in company shops, permits full-rate discharge from cars, thus more payloads per shift.

Berwind-White Tools Up, Hits Production Peaks

Industrial engineering lays the groundwork for higher productivity in Central Pennsylvania mine.



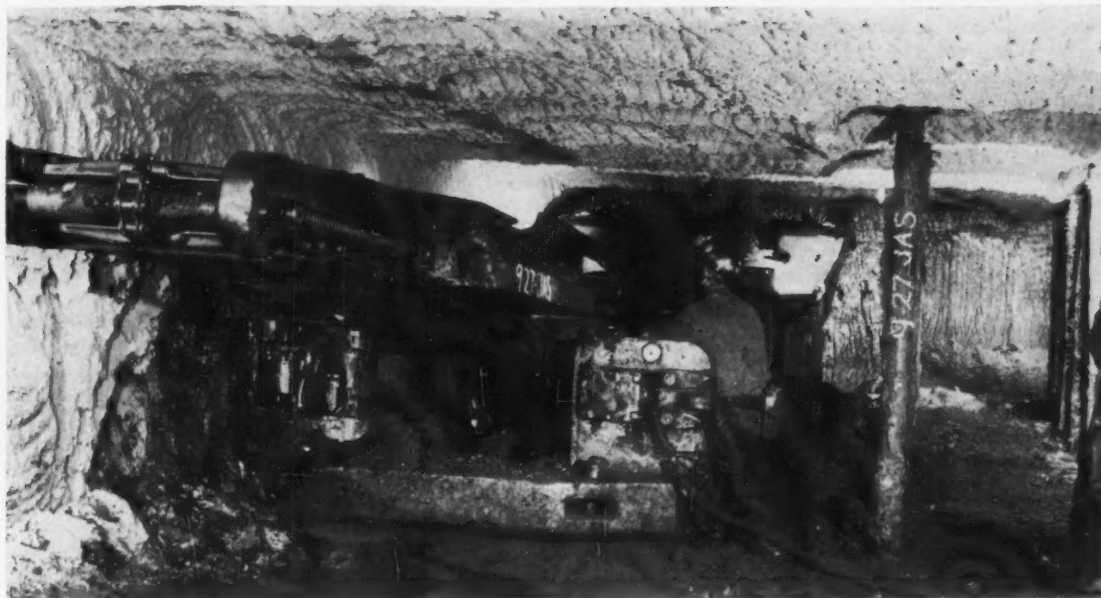
THE SEQUENCE of mining on the record-breaking shift at Eureka No. 40 Upper.

NEW METHODS applied to an old mine have made it possible to compete in the hard-pressed Central Pennsylvania coal field.

The mine is Eureka No. 40 Upper of The Berwind-White Coal Mining Co., located in Cambria County. It began production in 1909 in the Upper Kittanning seam having a thickness of 60 in in this area. Frequent clayveins interfere with orderly mining. Over the years the mine has kept pace with normal modernization changes. When the mine opened it was on a machine cut-hand loading basis. This method was partially replaced by conveyors which in turn were replaced by Joy loaders loading directly into mine cars.

With development of shuttle cars and mobile cutting equipment, a substantial improvement was made in the working cycle. Shortly after the mobile equipment became available, two ripper type continuous miners were obtained for development.

In 1958, Joy 5CM and Jeffrey Colmol continuous miners were placed in operation. These machines were



THIS MINER in two-shift operation has produced 209,011 tons without major breakdown or overhaul.

transferred from other mines where they were no longer required. Subsequently two CM37X Lee-Norse Miners were added.

Coincident with the introduction of continuous mining, intensive training of foremen and crews was undertaken with intensive industrial engineering studies. These steps were necessary to develop the full potential of new and improved equipment, as it became evident that the section foreman, as the key man in production, needed additional and specialized training to assure satisfactory results.

Every official at the mine participated in the initial program, each spending sufficient time in gathering industrial engineering data and how it applied to their section.

A maintenance training schedule for section foremen was established and conducted by the maintenance and industrial engineering departments. The objective was to provide a better understanding of the equipment under their supervision, with emphasis on the operating characteristics of each machine—its limitations and capacities, lubrication, hydraulic systems, subnormal operation of equipment and failures, repairs, equipment delay reports—purpose and need for accuracy, care and maintenance of conveyor belts and problems with power cables.

The initial training in industrial engineering directs attention to its fundamental nature and the relationship between the industrial engineering department, management and those in direct supervision of production. This is followed by detailed studies and applications of "Standard Data Methods" and the timing of the many repetitive parts of which the whole production process is comprised.

Analyses of the time and method studies are then made to establish production standards and basic man-machine charts, the latter showing what each man on the section will be doing during all phases of the cycle. Of great importance is that the need to change standards will be recognized, particularly as improved methods become incorporated in the working procedures—usually as a result of better data and experience.

The part of the program which is perhaps productive of the best results is the "problem" session. As each foreman receives his training, he is encouraged to note all problems which develop on his section. A conference is conducted to consider his observations and those of others to develop the best solution. The conclusions are written up and all parties concerned are furnished copies. Application of the solution is checked by an industrial engineer to determine its effectiveness.

Initial experience with ripper type miners functioning efficiently indicated considerably more coal could be mined from the face than could be loaded out. A more efficient system of getting the coal away from the miner, allowing the machine to operate uninterruptedly to obtain its full capacity, was desired. This was accomplished by having the miner discharge its coal on the bottom where it was picked up by a speeded-up 14BU loader for loading into the shuttle cars. These cars were the regular Joy 6SC shuttle cars which were built up to hold approximately four and one half tons of coal.

In the transfer of equipment from a non-operating mine, there were six Jeffrey 66 shuttle cars. These cars were improved to increase the hauling capacity and dumping speed. After the changes, it became apparent that improvements had to be made to prevent excessive conveyor belt spillage and permit rapid dumping of the full shuttle cars onto the conveyors. A feeder, as shown in an accompanying illustration, was designed and built in the Hollidaysburg Fabricating Division of Berwind-White. The feeder had sufficient capacity to receive the load from a full shuttle car, thus enabling the dumping of its load as fast as it could be discharged. The application was so successful that feeders were built to

supply all the units in No. 40 mine.

On the Colmol section, the same general plans are followed except that the loading machine is not used behind this continuous machine. With these improvements, and efficient supervision, a productive rate of two tons per minute can and has been realized on all sections of the mine.

When the need for additional equipment arose, studies made at other mines indicated that a Lee-Norse Miner CM37X was well adapted to the Upper Kittanning seam. The first of these was introduced in May, 1959; the second in September, 1959. As soon as the first machine went into production, studies of the machine were started which led to the establishment of standard work methods and procedures. As these were established, production increased from an average of 300 tons per shift to an average of 600 tons per shift sustained over a two-month period.

A peak of 877 tons per shift was attained by the Lee-Norse unit recently. This production shift worked a total of 420 face minutes with no mechanical failures. The average shuttle car haul was in excess of 300 ft.

The shuttle cars dumped onto a feeder which in turn fed a 30-in belt conveyor (U.S. Rubber belting on Goodman, Jeffrey and Joy conveyors). The belt discharged the coal into 3-ton mine cars placed by a Stamler hydraulic car spotter operated by one man. The diagram shows the sequence of mining operation for this peak production shift.

The working crews are under the direct supervision of a section foreman on each working shift. In addition, one mechanic is employed on each working shift for both Lee-Norse machines. The working shifts consist of two production shifts and one maintenance shift. The maintenance shift, starting at 12:01 AM, consists of two men who lubricate all machines, check and fill all gear cases, change all cutting bits, load up and deliver all mining supplies to the face area, place miner and cables in proper position for the production shift. This set-up permits confining the production shifts to the sole function of mining coal. Separate standards are established for the number of cars to be loaded in the first hour of operation which readily establishes performance in respect to getting an

Eureka No. 40 Management

Superintendent, D. E. Eakins; Inspector of Mines, G. Hobbs; Industrial Engineer, J. E. Kaite; Mining Engineer, F. Miller; Electrical Superintendent, W. R. Wood; Mine Foremen, R. Lang and E. Golas; Mechanical Foreman, H. Pritt; Preparation Foreman, H. Chezzi; Maintenance Supervisor, J. Kraycirik; Section Foremen, F. H. Durst, S. E. Mash, H. Phillips, H. A. Bodenschatz, G. Ledney, R. L. Sherlock, A. Beri, J. J. Korzi, J. Hagan, S. J. Kocsis, J. A. Swick; Supervisor of Transportation, S. F. Koot.

immediate start upon the crew entering the section.

While improvements were being made in the rate of production, studies were being made of ways to increase the actual productive time. One step was in procuring mine portal buses, each carrying nine men. Movement of these buses to and from the different sections of the mine are on a time schedule. These portal buses were manufactured and assembled by the Hollidaysburg Fabricating Division.

The overall haulage system has progressed from a pull and place plan, using electric hoists, with its time consuming delays, to the use of hydraulic car spotters. The resulting saving in time has been turned into more productive time at the face. All the units now in operation use the loop system of placing mine cars. This system has improved the efficiency of operations at this mine. An American Mine Door trackcleaner, Chicago-Pneumatic roof bolters and MSA rock-dust distributors are used in keeping services up to standard.

As the development of the mine progressed, it was possible to concentrate mining in the vicinity of a shaft that had previously been sunk to the Lower Kittanning seam for the purposes of ventilation. This shaft was partitioned for exhaust and intake air and the intake side of the shaft was neutralized for the purpose of providing a new mine portal. The addition of this new mine portal added 30 min to productive time.

As a result of the foregoing, in a period of 2 yr, the mine has improved from an average of 212 tons per unit shift to 428 tons; close to 20 tons per man on the mine payroll. The present workings are in an area where the underlying Lower Kittanning seam

has been worked out. Where the lower seam has been completely worked out or all left in, no difficulties are encountered. Where a change, such as pillars left in, makes bad roof conditions, extra timbering is necessary. A drop off in tonnage results.

Raw run of mine coal from No. 40 Upper mine is prepared at the cleaning plant. In this plant the coarse coal is washed in a 10-ft Chance-cone system, furnished by Fairmount Machinery Co. Slack sizes are cleaned by combination wet and dry methods. The extreme fines are pneumatically cleaned only in Roberts & Schaefer Super AirFlow coal cleaners. These units also serve as dedusters for a large portion of the coarser slack sizes which are washed in the Hydrotator-Classifer section of the plant. The usual complement of screens, conveyors and crushers are provided which permit considerable flexibility in sizing to meet marketing requirements. The degree of coal beneficiation too can be varied to suit the occasional changes which occur in the character of the raw coal. Quality is controlled by continuous sampling and frequent testing of the several cleaning units.

Washed coal from the hydrotator and classifier dewatering screens are thermally dried. Underflow from the classifier dewatering screen is mechanically dried in a Bird Solid-Bowl centrifugal filter. The thermal drying facilities consist of two Link Belt 12x24-ft Multi-Louvre driers. Fuel from the dried coal conveyor conveniently located in respect to the furnace is fired by an 8-retort Taylor type underfeed stoker supplied by American Engineering Co. Multiple retort underfeed stoker firing assures the maximum in combustion efficiency for coal having the characteristics of that produced at the mine. This method of firing also minimizes the incidence of incandescent cinders from the hot gases thereby assuring safe operating conditions at all times. A Bigelow-Liptak furnace is utilized to reduce the temperature of combustion gases to the operating temperature desired in the driers by intermixing with ambient air. Heat release from the as-fired coal approximates 65 million Btu per hour. Controls provide for automatic operation. Dust from the driers is collected in four special 16-ft diameter Raymond cyclone collectors equipped with Crites tubes.

An Analysis of the Causes Of Mine Fires and Ignitions

H. F. Weaver, Chief
Div. of Coal-Mine Inspection
U. S. Bureau of Mines
Washington, D. C.

WHENEVER coal-mining men assemble in the interest of safety they welcome a discussion of ignitions and fires—two monsters of the industry. One way to eliminate ignitions and fires is to eliminate the circumstances and conditions that have caused them in the past.

During the 8 yr immediately preceding enactment of the Federal Coal Mine Safety Act, 28 major disasters occurred in the coal mines of the United States and resulted in 563 fatalities. In the next 8 yr under the Act (July, 1952-June, 1960) 13 major disasters killed a total of 166 persons. This toll, however, was a reduction of 54% in disasters and 70% in disaster fatalities. This sounds very encouraging, but the continuing frequency of ignitions and fires, many of which could have been of major consequence, makes it necessary to seek basic causes and to eliminate them.

During the 8-yr period after passage of the Act, the Bureau of Mines investigated 209 gas and/or dust ignitions that caused 165 fatal and 235 nonfatal injuries and 395 underground mine fires that caused 30 fatal and 75 nonfatal injuries. These data include only those ignitions and fires of which the Bureau had notice. There may have been others that did not come to the Bureau's attention.

A breakdown of the 209 ignitions by primary causes shows that 64 (35%) were started by electricity, 37 by explosives, 41 by sparks from cutting bits, 35 by open flame or smoking, eight by flame safety lamps, four by mine fires, and one by lightning. In nine ignitions the source could not be determined definitely.

A further breakdown of the 74 electrical ignitions, the greatest offender, reveals that 29 were caused by arcs from trolleys or nips, 20 by open or nonpermissible face electric equipment, 11 by electric arcs due to lack of frame grounding, eight by arcs from damaged or defective trailing cables, three by feeder cables and three others by various sources.

A more detailed breakdown of the 37 ignitions from explosives shows that 16 were initiated by unburdened shots of permissible explosives in gas, 10 by unconfined shots of permissible explosives in gas, three by unburdened shots igniting dust, two by using the power circuit as the initiator and the other four by various sources.

The eight ignitions by safety lamps included four that

were caused by defective lamps, two by improperly assembled lamps and two by moving the lamp into a jet of compressed air in the presence of gas. These details of the causes of ignitions are self-explanatory. The cure in most instances is clear.

The Bureau recognizes that adequate ventilation is a primary factor in preventing gas ignitions, and properly installed and maintained electrical circuits and equipment will eliminate many points of ignition. Failure to make proper tests for gas boosts the number of ignitions.

Speaking of numbers, are there more or fewer ignitions?
In 1953, 28 ignitions occurred, and in subsequent years, 28, 21, 46, 28, 24 and 23, respectively. The curve has been definitely downward since 1956, and since there were only four ignitions reported for the first half of 1960 a record may be established this year.

Federal reports on inspections generally show fewer and fewer observed violations of Act and Code provisions that involve gas. This indicates that ventilation constantly is being improved. Certainly the educational activities of all agencies that contribute to this vital phase of coal-mine safety are finally leaving a lasting impression.

Of the 395 underground fires investigated 252 (64%) were caused by electricity, 41 were belt fires resulting from friction, 39 were caused by spontaneous ignition, eight by surface fires that crept underground and nine by explosives. The causes of 29 fires could not be determined and the remaining 17 were caused by various sources. A more detailed breakdown of the 252 fires of electrical origin shows that 119 involved trailing cables and 133 involved other electrical circuits.

The 119 trailing-cable incidents include 40 resulting from poor splices, 28 from short circuits in cable while on the reel, 19 from contact between a bare spot in the cable and equipment, 20 from equipment running over and damaging the cables, four from power being left on the cable in an idle area, four from short circuits in coiled cables, three from short circuits when pieces of coal fell on the cables and one cable fire that could not be definitely pinpointed as to cause.

The 133 fires from electrical circuits other than cables are divided into—50 from defective main or central circuits on equipment, 26 from falls on feeder cables, 19 from falls on trolley wire, seven from power wire touching equipment, six from trips touching trolley or feeder wires, five from high-voltage feeder cables, six from short circuits at feeder cable splices, four from arcing at trolley shoes, three from light bulbs igniting timbers, two from overheated ground wires, two from trolley wire touching equipment and three that could not be pinpointed as to cause of ignition.

Presented to J. J. Forbes Council, Holmes Safety Association, Birmingham, Ala., Sept. 15, 1960.

The Bureau's research in connection with developing a schedule for fire-resistant hydraulic fluids for use in underground equipment disclosed that 71 fires involved hydraulically-actuated equipment and that flammable hydraulic fluid contributed to the intensity of 54 of these fires and made control much more difficult.

As in the case of ignitions, the fire causes have been given in such detail that lengthy discussion is unnecessary for an understanding of how to prevent them. Fortunately only one of the fires was a major disaster. However, those who have participated in fighting fires know that each has disaster potentiality, especially when they occur in gassy mines.

A good question is "Are we doing as well in licking the fire menace as we have done in reducing ignitions?" The answer, unfortunately, is "No!"

Starting with 33 underground fires in 1953, the fire curve has climbed fast. Subsequent years show 46, 47, 49, 59, 62, and 69 fires, and by the end of 1960 the fire record may reach a new peak. During the first half of 1960 the Bureau investigated 40 fires. Unless this most unfavorable trend is checked, more fires will be experienced this year than in any year since 1952. Moreover, any one of these fires can get out of hand in a matter of minutes. An analysis of the inspection reports prepared under the Federal Coal Mine Safety Act shows that failure to provide adequate fire-fighting facilities is third from the top in number of violations of the Act observed during regular Federal inspections. This failure coupled with the ever-increasing number of fires makes a bad combination. It is most important that the industry be apprised of this situation. The Bureau will do its part by publishing the record and by discussing it wherever and whenever possible.

Investigations of the ignitions and fires indicate that injuries and extensive property damage frequently were held to a minimum because fire-fighting equipment was available and men were skilled in its use through training and dry runs. Adequate escapeways from the working sections were available. Rockdusting was adequate in the areas where most of the ignitions occurred in soft-coal mines, thus preventing widespread dust explosions.

In addition to administering the Federal Coal Mine Safety Act and conducting accident-prevention training for the mineral industries, the Bureau is continuing its program to develop methods of eliminating the major causes of mine ignitions and fires. Some features of this program are:

1. Cooperating with manufacturers in developing and testing fire-resistant conveyor belts, economical fire-resistant hydraulic fluid, incombustible thermoplastic insulation for trailing cables and equivalent protective devices to replace grounding conductors in trailing cables.
2. Conducting extensive studies of auxiliary ventilation in continuous mining places.
3. Making electrical surveys to determine the adequacy of electrical circuits and protective devices.
4. Developing a monitoring device to give warning and cut off power when the methane content of the face atmosphere reaches predetermined levels.

5. Experimenting with water-filled, self-sealing plastic bags for stemming explosive charges.

The Bureau also is trying to apply new ways, such as the foam-plug technique, for controlling mine fires. The Bureau is not unmindful of the possibility of developing effective fire-control devices that can be more quickly and easily transported, such as, a fire-resistant material that would expand hundreds of times its original size in seconds when certain chemical reactions take place. It may be possible to confine such material in small lightweight packages that could be carried close to the fire and tossed into the blaze. The persons doing the tossing could retreat to a safe place and let the chemicals do the job. Expansion of the material would smother the fire by completely filling the mine opening or by engulfing the burning machine. A material of this type probably can be developed; it certainly would be of much value.

Ways to prevent ignitions and fires are adequately covered in federal and state laws. However, 100% enforcement of most safety laws is virtually impossible unless those affected do their own policing conscientiously. Safety training has proved to be of inestimable value in improving safety consciousness—an absolute essential if progress is to be made. Spasmodic compliance with accepted safety practices is not enough because each act of carelessness, thoughtlessness or neglect can lead to a serious accident, and, under certain circumstances, to a disaster.

Only unrelenting, constant vigilance by each person associated with the coal-mining industry can curb the ignition and fire menaces.

YOUR POSTMASTER SUGGESTS:

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MAIL BEFORE DECEMBER 16, 1960"

**COAL
AGE**

Operating Guide

Belt Conveyors And Belting

Conveyor Types

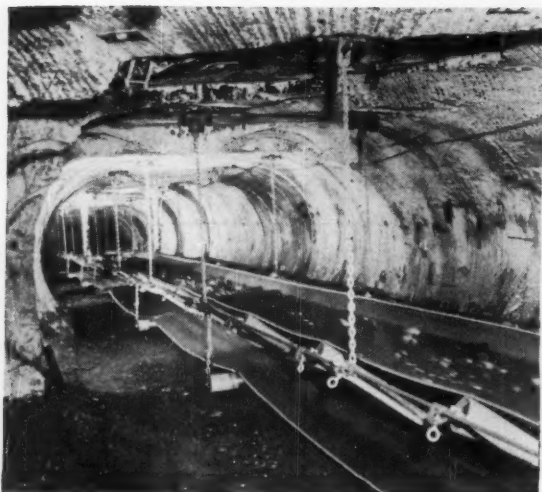
Conveyor Components

Feeding Conveyors

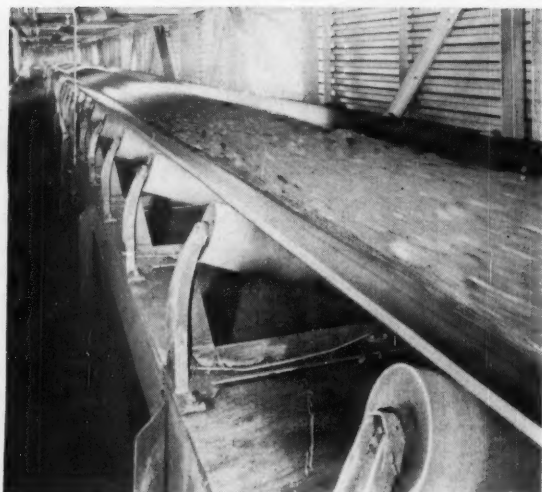
Conveyor Belting

Belting Maintenance

Conveyor Safety



ROPEFRAME CONVEYOR, developed some 5 yr ago, now leads in coal. Here the conveyor is roof-suspended.



RIGID-FRAME applications include hoisting as well as all other types of service above and below ground in coal.

Belt Conveyors and Belting

What's available in conveyors, belting and accessories, conveyor and conveyor-belt application, belt splicing, conveyor feeding, belt maintenance, conveyor safety and belt-conveyor troubleshooting.

CONSIDERING the various types of face-service and panel units now available, coal probably uses more different types of belt conveyors than any other industry. There are two major reasons for the growth of belt—and other—conveyors in coal:

1. They provide the maximum in continuity of operation, meaning that their availability for service is close to if not 100%.

2. They operate with a minimum of labor.

A third consideration in many instances of underground use is ability to provide haulage in thin seams without taking top and bottom.

With belt conveyors it is possible to handle coal from the continuous miner to the outside plant, and through the plant into the railroad cars or barges, or put it into storage and reclaim. New designs have increased the applicability of the belt conveyor.

Belt conveyors, aside from portables, might be classified as:

Engineered or custom-designed installations, such as, main-line, slope, overland and the like, where each installation is more or less individually designed.

Off-the-shelf, or standardized, units. This group includes the panel and extensible belts used underground as well as the prebuilt or prefabricated equipment now offered for surface use. Standardized packaged units result in lower cost, interchangeability of components and simplification of installation and use—all of especial importance for such equipment as panel and extensible conveyors underground.

Another possible belt conveyor classification scheme is based on type of idler or belt suspension, to wit:

Rigid-deck, or conventional.

Wire-rope suspension—a development of the past 5 yr.

Flexible-stand, with idlers supported in stands connected by wire rope, the latter, however, used for pulling and aligning only and not for carrying

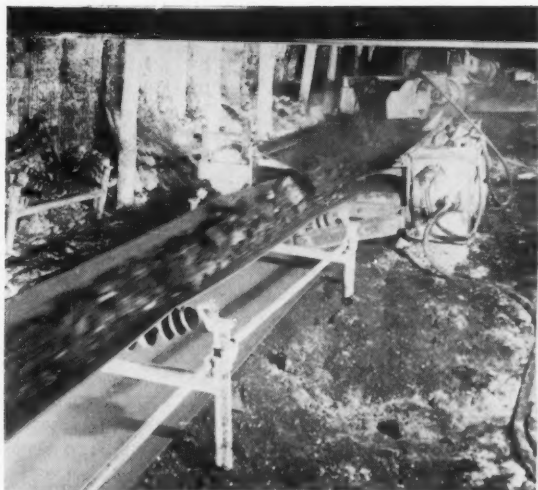
idlers to hold the belt and belt load.

Cable belt—so far only in Nova Scotia on the North American continent but a good possibility for application in the U. S.

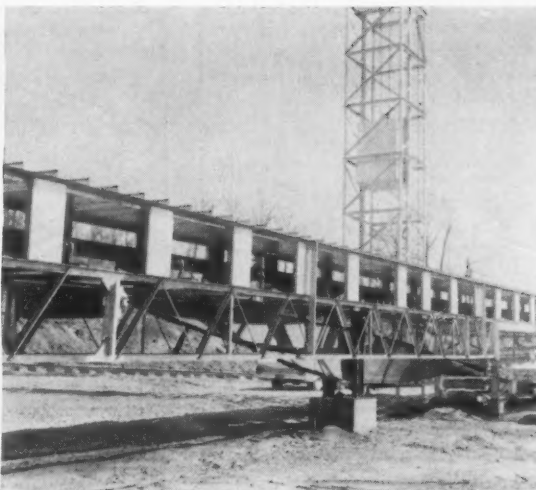
Turnover belt—a modification of the conventional type with a 180-deg twist in the return belt strand at both the head and tail ends. It is offered where sticking and freezing of material in wintertime is a problem. The double twist of the bottom run, accomplished by additional snub or turnover pulleys, plus possibly vertical rollers, keeps the bottom or clean side of the belt against the return rolls. Surface wear of return idlers also is reduced, and the need for decking over the return strand is lessened, since spillage material is automatically dumped when the belt starts through the twist. In at least one instance this principle has permitted troughing idlers to be used on the return run instead of the regular flat type. Belt top cover wear caused by contact of the dirty, gritty surface against the return rolls in the conventional system also is eliminated.

Conventional v. Ropeframe

The ropeframe conveyor—another truly coal-mining development—has, for all practical purposes, taken over the panel and extensible field, and is



EXTENSIBLE is a special type of belt conveyor designed to give continuous miners maximum opportunity to produce.



TURNOVER CONVEYOR turns the belt over by vertical guide idlers so that the clean cover is always on the idlers.

making major headway in mainline and surface service. Reasons for the use of the ropeframe unit include the following:

A major reduction in first cost—up to one-third or more, depending on length.

Parts and components occupy only approximately one-third the space of rigid-deck conveyors, representing a two-thirds cut in cost of moving equipment to and in the face area, and also in storage space.

Erection time is cut drastically—up to one-third or more. The design also lends itself to only partial erection for operation, thus cutting loading delays.

The characteristics of the ropeframe design also permit suspension from the roof, which facilitates provision for free passage for shuttle cars, service trucks and other mining equipment. Roof bolts are used for anchorage. Installation is simple and rapid, and vertical and horizontal alignment present no problems.

Except for permanent installations, ropeframe conveyors usually are sectioned into definite lengths—200, 300 ft or other multiple, depending, for example, on shuttle-car haul, crosscut distances, etc. Belt may be added at the head or tail.

Conveyor Components

The basic components of a belt conveyor, aside from the motor, speed-reducing and other power-trans-

mission equipment, and the belt itself, are the head and tail terminals and the intermediate sections.

HEADS AND DRIVES — Though the objectives are basically the same, drive and head arrangements for in-plant, surface, portable, slope and sometimes mainline conveyors underground may differ considerably in details.

Simplest of the drives — normally for the shorter, lower-capacity equipment — is a combination head and drive pulley. With a belt wrap of 180 deg its ability to move the belt and load is limited. Consequently, snub pulleys are employed to increase the wrap up to approximately 230 to 240 deg. Depending on the application this may be sufficient for even a heavy-duty large-capacity unit with good pulley lagging. Snubbing and thus increasing wrap permits operating with a slack-side belt tension more nearly approaching the minimum required for drive operation, and thus may enable a reduction in number of belt plies or weight of carcass. Even if no ply or size cut is possible, lower tension increases belt life.

Where very heavy loads must be moved over considerable distances, as in slope hoisting, the dual drive increases belt wrap up to double or more. If desired, individual motors may be used on both the primary and secondary drive pulleys.

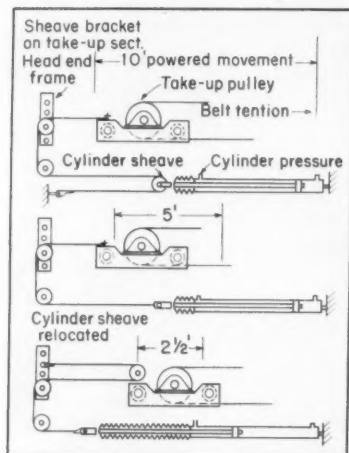
Driving on the head pulley still is the practice with some of the smaller, lighter-duty underground conveyors.

But with most of them being extended to 3,000 ft or more, the tandem drive (two drive pulleys geared together) is finding wider use for efficient operation with minimum slack-side tension. The two-motor drive also is receiving attention for underground service. When the conveyor is first extended only one complete power unit and motor are required, the spare-parts inventory is cut materially, parts and units are more likely to be found in stock at manufacturers' warehouse, and the weights of individual units are reduced materially. And if one drive should fail in operation the other can carry material at a reduced rate.

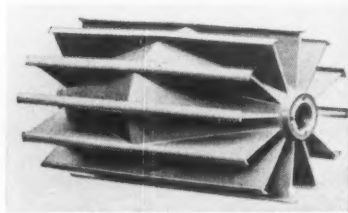
Separation of head pulley and drive unit is a growing practice underground. With a suspended head, in fact, the drive unit may be placed anywhere along the slack side, thus permitting location at more convenient points for protection, inspection and service. Suspended drives are available to permit complete suspension of the entire conveyor. Because it permits unrestricted operation of other equipment underneath, or may avoid troubles encountered in bottom mounting, suspension is a growing practice. Roof bolts are of course the suspension medium, and installation normally is rapid and simple.

TAIL SECTIONS — For mainline, slope and surface use the tail terminal usually consists of apparatus for holding the tail pulley in position. It may also include a belt cleaner or scraper, snub or bend pulley, and sometimes

Belt Conveyors and Belting



POWER TAKEUPS facilitate tensioning belts automatically.

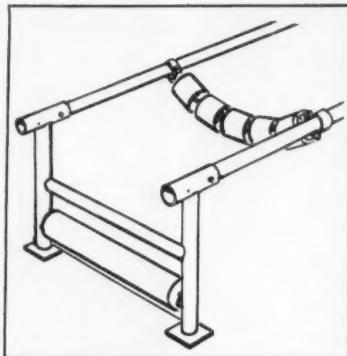


SLATTED PULLEYS help keep belts clear of sticky material.

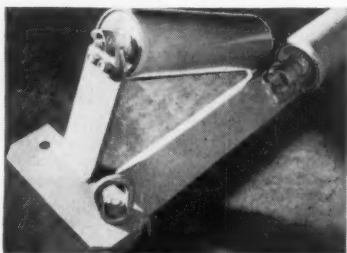
may incorporate impact idlers. Tensioning also is frequently done at the tail, and the terminal may therefore include the necessary facilities. Crawler-mounted terminals, including transfer or transfer and bridge conveyors normally accompany extensible-type conveyors.

PULLEYS—The major consideration with pulleys is proper diameter. Pulleys too small have a major adverse effect on belt life. Drive, terminal and other pulleys may be crowned or straight-faced. Crowning helps in training the belt but where belts are long and tension runs up, some authorities feel that crowning the head pulley by throwing extra stress into the belt carcass as it negotiates the pulleys, may shorten its life materially. Crowning of tail, head and other pulleys, on the other hand, is less likely to increase stress and can help in training.

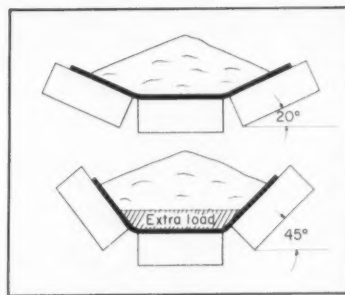
Lagging normally is recommended for drive pulleys to increase grip and cut slack-side belt tension, which can make it possible to use a lighter carcass and in any event increases belt life. Lagging of snub, bend and other pulleys also is recommended when the



FLEXIBLE IDLERS are here combined with pipeframe structure.



OFFSET ROLLS feature new idler, cradle type, for ropeframe conveyors.



INCREASING side-roll angle to 45 deg raises belt capacity appreciably.

coal is wet and tends to stick, cutting wear on both pulleys and belt. Fluted or ribbed pulleys frequently are used at the tail, and possibly at snub and bend points, because of their self-cleaning characteristics. Dirt buildup is prevented and the fluted design lessens the possibility of some bulky object punching a hole in the belt.

ROLLS AND IDLERS — Single straight rollers originally were standard for the return side with rigid-deck conveyors and still are for the ropeframe type also. For the loaded side the three-roll carrier is almost universal. On ropeframe equipment the rolls may be mounted in a cradle for

rigidity, with the cradle hung between the ropes. Most designs provide for projection of the center roll below the cradle frame so that in case of extra sag of the loaded strand the empty strand will contact the roller rather than scrape on the cradle. Some cradle and carrier designs provide for offsetting the center roller to facilitate removal of any of the three individually.

A variety of limber or flexible carriers has been developed in recent years. Types include rubber on wire rope and conventional-type rolls with flexible joints. They have more give, which means less shock and movement of the load as lumps go over them, and also increases the self-training action of the belt. They also sag somewhat under load and thus deepen the trough of the belt and increase its capacity.

An inclination of 20 deg has been almost standard for the side rolls on the three-roll carrier, this in spite of the fact that raising the angle to, say, 45 deg, would increase the load-carrying ability of a given-width belt up to 20 to 25%. The trouble has been that belts would not take it because they were creased too sharply. With new, lighter and more-flexible belts it is expected that side-roller angles of up to 40 to 45 deg will become increasingly possible in the future.

SPECIAL IDLERS — The three major "special" idlers or carriers are:

1. **Training idlers.** Even with the best of installation, unequal loading or some other condition can cause belts to run crooked and thus warrant the use of training idlers. This is true even with ropeframe conveyors where a high degree of self training is inherent in the carrier suspension, but where side loading, for example, can still cause a belt to work over far enough to get in difficulty. This is more likely to happen when long units—up to 4,000 ft or more—are in service.

2. **Impact idlers.** Loading between standard carriers theoretically is the thing to do to cut impact on the belt to the minimum. Actually it may be difficult or undesirable for other reasons. The answer then becomes impact idlers of the right type and in sufficient quantity to do the necessary job of belt protection.

3. **Rubber-disk return idlers.** These idlers may be used where material

would tend to build up on a straight roll. The disks permit the belt to flex, usually loosening the material and permitting it to fall free. "Beater" idlers, with lengthwise ribs, are another version relying on impact to loosen and free material.

IDLER SPACING—Type of conveyor and service will determine spacing, which normally is worked out by the manufacturer or can be determined from tables which he supplies. One goal is a minimum of sag consonant with cost of carriers, since if there is too much sag the load shifts from carrier to carrier, increasing power consumption and wear on the belt. With excessive sag the belt tends to flatten between carriers and may spill part of the load. Lump impact on idlers also is greater with excessive sag.

Since tension drops from the drive to the tail end, sag tends to increase. Thus, gradually reducing the spacing of the carriers from drive to tail can keep sag within practical limits and save in power and belt wear.

TENSIONING EQUIPMENT — On short, light belt conveyors, such as, for example, portable stockpiling units, the screw-type takeup in the tail terminal is practically standard and quite satisfactory. It should be adjusted tight enough to equal the slack-side tension plus enough additional to avoid frequent adjustments as a result of temperature changes, etc.

On high-capacity permanent installations, especially slope and above-ground, automatic gravity equipment employing a suspended weight of the proper magnitude is almost invariably employed. One advantage of the weighted takeup is that there is no possibility of over-stressing the belt.

Underground there is a move toward built-in compressed-air or hydraulic tensioning devices which automatically respond to variations. Older systems, still in use and, of course, lower in investment cost but not automatic, involve as a rule jacks and chains or ropes at the tail terminal.

Employing either a cylinder or winch with air or hydraulic motor the automatic type provides, depending on reeving with the cylinder units, 10 to 20 ft or more of powered travel. On the basis of one rule of 1 ft for each 100 ft of length with long conveyors, considered to be fairly conservative, such takeup equipment

can handle tensioning automatically up to 2,000 to 3,000 ft after the necessary preliminary measures to fit the belt to the conveyor.

BELT CLEANING EQUIPMENT

—Rubber blades held against the belt at the proper pressure by springs or weights are the most common types of belt cleaners. Brushes or rubber rollers also are employed, and, as noted in previous paragraphs, special pulleys and idlers are used to help the belt free itself of sticky material. A field-developed cleaner consisting of a piano wire fixed $\frac{1}{8}$ in away from the belt at the head pulley and tensioned by a weight is reported to be one of the better units.

BACKSTOP EQUIPMENT

—Where conveyors are inclined, rollback under load can result in major damage in addition to possible hazard to personnel. Holding devices, or backstops, therefore are essential. One is a simple ratchet and pawl. Brake drums and brakes, differential-band units and others, including for major slope belts, big post-type hoist brakes, are the major devices for preventing rollback. Naturally, they are arranged to go on automatically.

Conveyor Auxiliaries

Aside from feeders, discussed in a following section, a variety of auxiliaries are available to facilitate the erection, moving and use of belt conveyors. For surface units, the auxiliaries include:

Trippers for placing coal in bins or in a long stockpile on a lower level than the belt, or in railroad cars on both sides of a trestle.

Plows, performing much the same functions as trippers.

Slings, or powered devices for throwing the coal out a considerable distance in outside stockpiling. Normally they would be used only with fines where degradation is not so critical.

Underground, the auxiliaries include:

Towing-service units, usually crawler powered, fitted with winches and most helpful in moving and positioning terminals and other conveyor gear.

Belt winders. Where there is extensive use of panel and similar types of belt conveyors underground a belt winder is a real necessity. It saves time, reduces the possibility of injury and prevents damage to the belting

itself. It need not be self-moving but it should include power equipment for winding belt on and off. One manufactured unit operates off the hydraulic tensioning unit and includes a steel reel and ramps that can be dropped down for loading and unloading the reel. It will accommodate reels holding 360 ft of belt up to 42 in wide. A wire-rope system can be employed to pull belt off either the reel or the conveyor.

Conveyor Belt

Beginning some 5 yr ago a minor revolution has taken place in conveyor belt for coal. The solid-carass belt has moved into first place in purchases. PVC impregnation, the first to be used with solid-carass types, now is being hotly challenged by neoprene. Ply-type belts are being redesigned to make them thinner, lighter and more flexible. A fire-resistant designation is now essential for underground belts. PVC and neoprene provide this characteristic.

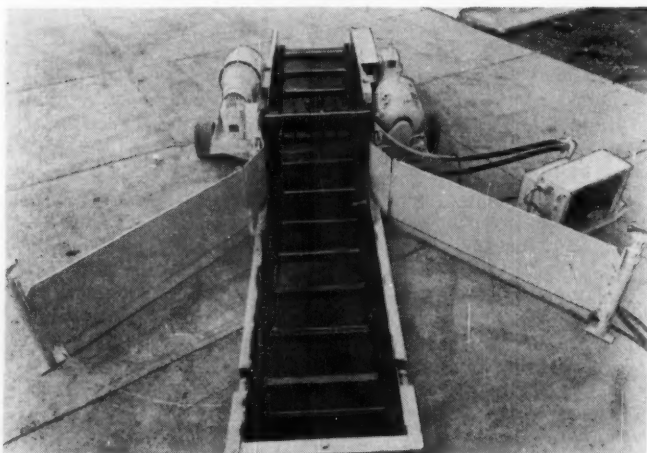
Exclusive PVC belt suppliers are primarily those offering types originated abroad. Some U.S. manufacturers offer only the conventional or new-design ply-type belts. Most, however, give the purchaser a choice, not only of type of carcass but of elastomer—i.e., PVC, neoprene or others. Some of the leading old-line U.S. manufacturers, however, are so far offering only neoprene with solid-carass types.

The present situation might be perhaps summed up as "purchaser's choice" after weighing type and cost, belt construction and elastomer, against the type of service. For surface use, of course, natural and GRS synthetic rubbers are additional elastomer possibilities.

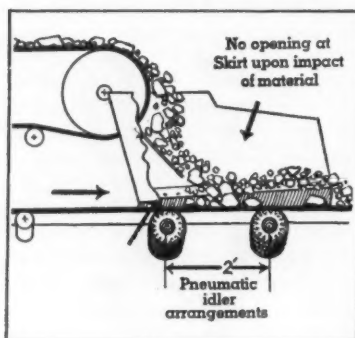
Thinness and extra flexibility with equivalent strength in new ply-belt designs employing high-strength synthetics is evidenced by a comparison offered by one manufacturer of his new v. his old-design belt:

	2-Ply	5-Ply
Vulcanized-splice rating, lb per in of width	300	300
Wt per ft, lb	5.92	8.09
Belt thickness, including covers, in	0.385	0.552
Min. pulley dia., in:		
Head drive	20	36
Tail	16	30
Takeup	16	30
Low-tension Snub	12	24
Wt, 500-ft roll, lb	2,950	4,000
Dia., ft-in	4-10	5-9

Belt Conveyors and Belting



TAIL-AND-HOPPER COMBINATION for shuttle-car transfer includes skirts to form load and is skid-mounted.

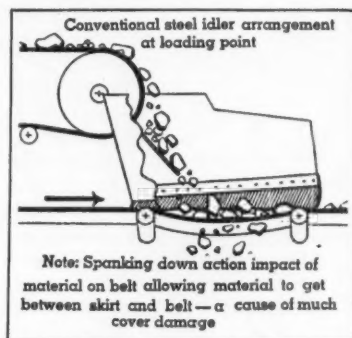


BELT-TO-BELT TRANSFER should include chutes and impact idlers, plus the necessary flexible skirting to ease the switch and protect the belt.

The increased flexibility of new designs is such that manufacturers are now beginning to guarantee them unqualifiedly for idler-roll slopes up to 45 deg. Ability to operate at such slopes materially increases conveyor capacity—up to 20 to 25% or more, depending on conveyor width, material, etc.

Ply-type belts are much easier to splice by vulcanizing, though the strength is always reduced one ply's worth. That is, if a 5-ply belt is spliced the strength after splicing is equivalent to four of the plies.

The solid-carcase, or 1-ply, belt offers a different construction, varying in some details between manufacturers. A vulcanized splice can be made but it is a tedious job involving taking the carcass completely apart and reweaving the two ends into one. Consequently, mechanical splices are almost universally used, and some manufacturers claim a rating of up to 75% of original belt strength after work hardening.



Belt Feeding

How material is put on a belt is perhaps the major factor affecting its ultimate life. It may also, in the case of underground belts, particularly those receiving from shuttle cars, materially affect the performance of face units.

SHUTTLE CAR TO BELT—Transfer in this category can be either end or side. It was, usually, accomplished directly in the early days and still is in many instances.

Answers include surge cars and intermediate surge conveyors or feeders. The objective in all instances is acceptance of the full rate of the shuttle car discharge while feeding to the belt at a lower rate.

Properly chosen as to capacity, such equipment can help materially with the overloading problem where 2 or 3 cars dump to a belt, since the ratio of receiving to discharging capacity can be selected so that even with all feeders operating the belt cannot be overloaded.

Where loading is direct over the end some form of hopper should be employed to help shape the load, guide it onto the belt and provide a little surge capacity. Most manufacturers of underground conveyors offer a tail assembly complete with hopper. Usually it is skid-mounted but some are provided with crawlers for powered movement. In side loading of belts from shuttle cars a common practice is a skirtboard on the opposite side to prevent the coal from shooting over. Skirtboards may be used on both sides and can be designed so that the conveyor can handle coal from an inby point also. Side-loading units offered by manufacturers include types that can be thrown back to permit use of the conveyor to handle men or materials.

Special units include a chain-type feeder conveyor on which an independent rotary pick breaker is mounted. The aim is to eliminate the problem of oversized lumps by reducing them to, normally, 10 in maximum for a 30-in belt and 12 in for 36-in. As with other feeders, the unit eliminates spillage at the tail section, centers the load and evens out the feed to the belt.

BELT TO BELT—If consecutive conveyors are in line the problem of easing impact and other difficulties in transfer is eased. Here the goals include moving the coal onto the following conveyor at as low an angle and at as nearly belt speed as possible. The chute should include wings on each side with proper skirting to center and shape the load properly on the belt. Also, the bottom lip should be provided with fingers or be cut out in the form of a V to put the fines on the belt first as a cushion for the lumps. Wear is reduced. Impact idlers should be used for additional belt protection.

If a belt feeds to another at right angles the chute should be curved to turn the coal in the direction of the receiving unit. If two or more cross belts feed to a collecting unit, the outby chutes must be either high enough to clear all lumps, which may increase impact and spillage, or must be hinged to permit the chute to swing up if an extra-sized lump comes along.

Pileup safeguards are essential where belts feed one to another. The pileup may result from obstruction or the stoppage of the outby belt. The

usual protection is paddles or fingers which are actuated by the coal as it builds up to shut off the conveyor system.

HOPPER TO BELT—Various types of feeders that may be employed to transfer coal from hopper to belt include belt, chain, apron, reciprocating and vibrating. Under some conditions, as in feeding to a slop or other belt terminating in the preparation plant, or in blending sizes from several bins, the feeder or feeders may be equipped with variable-speed motors or drives. Maximum feeding rate—but no variation other than changing position—can be provided by a gate or plate in the feeder throat.

Design of the chute from feeder to belt is, as in transferring from belt to belt, a critical item, and the same standards apply. In addition to cushioning impact and reducing cover wear, the layer of fines on a slope or other inclined belt prevents lump movement and rolling and permits operation at higher degrees of inclination, thus permitting reductions in slope and belt length. Even with horizontal belts the fines cushion contributes materially to smooth, low-wear operation.

Critical belts, such as main slope units, may be preceded by short shock conveyors to take the beating and limit damage to a shorter and less-costly length of belt. Frequently they are supplemented by magnetic tramp-iron detectors, which shut down the shock unit and transmit a signal to permit quick removal of the iron.

Belt Storage and Handling

Though some types of conveyor belting are more resistant to the effects of bad handling than others it takes its toll with all. Sometimes that toll is a heavy one. It can be reduced to zero by such steps as the following:

Handle old and new belts carefully. New belts should be kept in their original packages until put into service. Do not drop. Do not pry or roll with bars. Roll crated and rolled belts in the same direction as the roll is wound. If rolls are handled with slings, use bar through the center for lifting and protect belt edge with plank. Do not place sling around a belt roll. Do not bend belt more sharply than minimum pulley diameter in handling and installation.

Store belts in an upright position.

This, among other things, equalizes edge moisture and eliminates bowing. If belts are not supported off the floor the floor should be clean, dry and level, and the belt should be stored—in an upright position—on the flat surface and rotated regularly. Never lay a roll of belting on its side. Moisture pickup is one reason. Never lean a roll of belting, even when mounted off the floor, on a bar through the shell.

Maintain proper storage conditions.

The ideal storage temperature is 50 to 70 F and continued exposure to temperatures under 32 and over 90 F should be avoided, though short colder or warmer fluctuations are not harmful. Relative humidity should be kept between 20 and 70%. Excessive humidity will encourage mildewing in spite of inhibitors, and the belt carcass will take up water even through the covers if exposed to dampness over a long period of time. If it is expected that storage will be for an extended period the manufacturer in many instances can seal the roll upon request. Belting in storage should not be exposed to ozone or direct or reflected sunlight. Thus, storage close to motors or generators should be avoided. If the edges of a roll are exposed they should be painted with neoprene or rubber cement to keep out moisture. This is especially important with used belts.

Use proper equipment and methods in moving belting in the mine. Preferably wind it on a horizontal spindle and move it upright. However, in low coal, it may be wound on a vertical spindle. In both instances the spindle should be mounted on an appropriate truck-rail or rubber-tired.

Belt Installation

In addition to correct conveyor installation, outlined elsewhere in this Operating Guide, the major considerations in belt installations—to avoid damage and assure maximum life include the following:

Check conveyor and component parts thoroughly before belt installation, including structure, pulley, idlers, loading equipment, and skirt-boards or skirting facilities—particularly for alignment and clearance.

Position belting roll properly, whether on a horizontal or vertical spindle.

Unwind belt by power if possible.

A wire rope and pulling plate may be used, or the new belt may be attached to the old in replacement.

Keep belt tight as it is unrolled to prevent twisting or telescoping. Avoid sharp twists, bends and hard pulling. Unwind slowly. Watch for catching and kinks.

Pull belt into position by block-and-tackle, winch or similar equipment, using special clamps on end to distribute pull evenly across entire length.

Exert sufficient tension in pulling belt together so that screw take-up is in proper position when splice is made. With counterweighted gravity-type takeup, apply sufficient force to move takeup pulley from maximum position to correct position. The belt should be no tighter than is necessary to prevent slipping on the drive pulley or pulleys under maximum loads. This tension also should eliminate abnormal sag between troughing idlers near the tail and at all other loading points. Excessive tension, as a result of excessive return-strand tension, may cause unnecessary belt stress, premature splice failure and load on bearings and shafts. Lagging of drive pulleys, increasing the coefficient of friction, cuts the tension required to prevent belt slippage, and may, in some instances, permit reducing the number of plies in the belt. Where metal splices are employed lagging helps protect them. It also provides a cushion for any material trapped between pulley and belt. Head pulley, snub pulley and takeup pulley should be lagged in the opinion of some authorities. Automatic takeups may be desirable as a convenient means of compensating for belt-length changes resulting from tension variations occurring during starting, braking, partial loading or other abnormal operation.

Check training, including return run, and tail pulley before operating with load. The belt should be trained empty by adjusting idlers where the belt runs out of line. Since the return run is more susceptible to damage during training it should receive first attention. Advance idlers slightly on the side the belt is out of line and in the direction of belt operation. Extend adjustment to several idlers rather than excessive adjustment of only one or two. Watch for edge contact. Adjust load strand, if necessary, the same way. Make a final check of

Belt Conveyors and Belting

training with the belt carrying normal load.

Check loading and discharge points for belt alignment, freedom from rubbing, etc.

After belt is installed and running properly check power demands and make volt, ampere and watt readings with belt empty and loaded for later use in checking on conveyor and belt condition. Of course, if the initial readings are excessive the installation should be checked once again for frozen idlers, dragging return belt, rubbing or other things that would load up the motor.

Belt Protection

Basic in belt protection is a properly erected conveyor structure and a properly installed belt, as indicated in previous sections. Additional protection includes the following:

Keep belt headings clean and clear of obstructions, tools and materials.

Provide proper roof and rib support.

Keep belt headings free of water and protect conveyor and belt from drips.

Ventilate beltways properly and rock-dust to approved standards.

Reduce the fire hazard as follows:

A. Use approved cables, wire and electrical equipment and install in a safe manner.

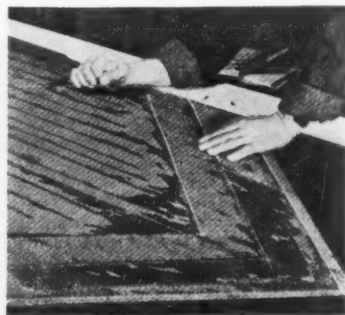
B. Use approved flame-resistant belts, and fire-resistant materials for pulley lagging, skirting, etc.

C. Guard against frozen or hot-running idlers by regular inspection and proper lubrication. Do not overlubricate. The result will be grease on belts and structure, which is hard on belting and an additional fire hazard.

D. Tension belt correctly. Undertension results in drive slippage and excessive sag between idlers. Excess tension accelerates belt wear, shortens splice life and is hard on drive and takeup mechanisms. Excess tension also may result from improper maintenance of rollers, idlers and carriers, excessive tightening of takeup screws, too heavy a takeup pulley, overloading of belt and shrinkage through exposure to moisture. Where possible automatic takeups of the proper type are a big help in maintenance of proper tension. Tension reduction, as noted in the preceding section, can be achieved by pulley lagging.



MECHANICAL SPLICES include this patented V-type with metal fasteners.



DIAMOND vulcanized splice is offered for smoother operation and strength.

E. Eliminate spillage and overloading, prevent pileups at loading and transfer points, and keep coal, rock and other material of all types away from belt and conveyor—in other words, good housekeeping.

F. Install automatic overload and heat-sensitive switches on motors.

G. Use roller switches or other devices to stop the motor when the belt slips or stops.

Provide proper fire-fighting equipment, including extinguishers and rock dust. Some operators also parallel long-lived belts with water lines.

Use self-aligning idlers to supplement accurate alignment and training and provide further insurance against rubbing or other damage.

Install equipment to prevent accidental reversal or overspeeding.

Provide emergency stop protection, such as, the two-wire low-voltage system or the pull-wire system above or alongside the conveyor.

Provide for sequence start and stop (plus means of test operation out of sequence) where two or more conveyors are operated in tandem.

Guard against pileup at loading and transfer points by paddle switches, finger switches, panic chutes, etc.

Provide feeding facilities that will deliver the coal to the belt with as near proper direction and speed as possible (see earlier discussion).

Consider, where possible, fuller loading and lower belt speed to reduce impact wear and load agitation in passing over idlers. Tension is increased, however, and a check should be made to see that it is not excessive.

Employ automatic controls to permit only one feeding unit to run or cut both to half speed when two units feed to a belt—likewise with three or more. Otherwise, provide sufficient capacity in the collecting conveyor to handle the peak output of all feeding units.

Load between idlers where possible or, if not, use cushion idlers to reduce impact on belt. Also, as previously noted reduce chute angle. In permanent installations where the tonnage is high a short "shock" belt may be employed to take the beating when coal is discharged from, say, a dump bin. Another device is a short pad belt under the main belt at the loading point.

Limit lump size, if possible, as big lumps pound the belt each time they pass over an idler. Some remedies include a heavier cover or slightly increased belt tension, plus graduation of idler spacing.

Install magnetic detectors or other equipment to protect against tramp iron, especially with mainline and slope belts. Magnetic pulleys and suspended magnets may be employed ahead of belts it is desired to protect.

Provide skirtboards, skirting and shapers as required to slope the load, help position it properly and prevent spillage. Skirtboards and skirts should widen and rise as they leave the loading point to prevent jamming of the material. If contact with the belt is necessary, use special skirting material available from the various manufacturers. It will wear rather than the belt cover. **DO NOT USE** old conveyor belting, which may be highly abrasive.

Provide controlled starting—not across-the-line. Avoid abrupt stops.

Provide belt cleaners and scrapers

to prevent buildup of material on pulleys and idlers—and also keep lumps from jamming between belt and tail pulley. A deck over the lower run is worth consideration on major long-lived belts. Lagged bend and snub pulleys and idler sleeves also help reduce buildup.

Use mildew-inhibited belting.

Lubricate properly.

Repair damage promptly.

Graduate idler spacing for the ultimate in provisions to reduce wear.

Permanent Splices

Joining of sections making up long-lived or permanent belt conveyors—mainline, slope, surface, etc.—has long been done by vulcanization, since this method, incorporating the stepping of plies and the reconstruction of the belt to as near original condition as possible, results in maximum strength and a smooth splice with greatest flexibility, thus assuring smoother, more troublefree operation. In addition to square-across or angled, the “diamond” splice is said to provide a smoother—operating more—troublefree joint with maximum strength.

PLATE SPLICES—As an alternate to vulcanization, plate-type splices also have been used for many years. They are, with some special exceptions, applied either straight across or, less customarily, at an angle of 45 deg, this latter to compensate for smaller pulleys. Though requiring about one-third more fasteners the 45 deg splice will operate over pulleys with 25% smaller diameters.

Special splices employing mechanical fasteners include a V-type offered by one organization (Pat. No. 2,814,846). “Experimental and on-the-job tests have proved the splice to provide a degree of dependability, safety, tightness and durability equal to conventional vulcanized splices for operating tensions up to 700 lb per in. of width rating on belts of five or more plies and thicknesses of ½ in. and over” up to 1¼ in. The splice may be applied “on belts of natural or synthetic fabrics, cord construction, or any combination strength-member construction with the exception of steel wire.”

Hinged Splices

Splices of the hinged type permit quick joining and separation of belt

sections—especially valuable where extensible belts are employed. Fasteners are individual with some types and employ bolts in drilled or punched holes. A second class, using pointed drive rivets, employs fastener elements made up as one piece with scores between sections to permit the sections to break apart when the belt first goes into service. The fastener element, it is noted, also serves as its own installation template.

With all types, special wide fasteners, equivalent to 2 or 3 regular units, normally are offered for extra edge strength (one on each edge). Their use is possible, especially with conventional cylindrical idler rolls, because the belt does not trough for some distance inside the edges.

Although some metallic lacing is offered for troughing belts it normally is less adaptable than the plate-type units or the wire-type fasteners originally developed abroad. Applied with a special tool the wire-type splice permits normal troughing and operation over pulleys.

Hinging makes possible shortening the stiff sections of the splices, which is an advantage in operating over pulleys. It is also necessary to check these ends frequently.

SPLICE STRENGTH—Plate-type fasteners, whether of the permanent or separate type, depend for their holding power largely upon compression spread over as wide an area of the belt end as feasible. Since there necessarily must be some space between plates, and only so much compression can be applied, only a certain percentage of the original tensile strength of the belt can be developed.

Making a splice that will develop maximum pullout resistance and holding power involves, among other, the following considerations:

1. Belt condition. If carcass and elastic materials have deteriorated it is obvious that splice strength will be reduced. Cutting belts back to sound material is a necessity where ends have deteriorated or been damaged.

2. Proper fasteners for the job. Correct size of fasteners, particularly of the plate type, depends on belt thickness and pulley diameter. Belt thickness is perhaps the major consideration. Pulley diameter is important because the bending of the belt behind the fasteners as it goes around the pulley affects its flex life.

3. Accurate belt cutting. Unless special belt cutters are employed templates should be used. If edges have been messed up template setting should be done from a line determined from several center points at intervals the necessary distance back from the cut.

4. Proper tools. In addition to belt cutters and templates tools especially suited to making splices should be employed. They include belt grips for easy handling and also aligning holders, belt clips and gage rods for accurate fastener application. Belt clamps which provide a mechanical means of pulling belt ends together and keeping them in alignment during installation on the conveyor, as well as during fastener application, splice installation, etc., save time and give better results.

5. Skilled employees. A man who knows his job is, in belt splicing as in all other operations, more likely to get the best results.

Belt Repair

In repair and maintenance of conveyor belting, as in all other aspects of conveyor installation and operation, the interested user should have a complete file of the instruction manuals and leaflets issued by the manufacturers of conveyors, belting, fasteners, splices, repair materials, vulcanizers and so on. An up-to-date collection of this material, properly used, will insure long, low-maintenance belt life.

Until recently solid-carcass belts have been considered repairable only to a limited extent—use of rip plates or fasteners to mend tears and the like. Since they are less susceptible to damage, according to field reports, limited adaptability to repair is not too much of a handicap. Usually “repair” is a matter of cutting out a section suffering major damage and installing a mechanical splice at that joint. Vulcanized splices are possible but require long and tedious unweaving and reweaving of carcass members—normally considered uneconomical except for special situations.

Ply-type belts with the usual covers lend themselves more readily to a variety of repair measures involving covers, edges and plies, with or without vulcanizing or self-curing.

FORESTALLING REPAIRS—Preventing belt damage starts with the

Belt Conveyors and Belting

Conveyors for Mining, Preparation and General Use

	Brand or Model	Type	Widths, In	Heights, Ground Mounting	Drive	Speed, FPM	Takeup
Barber-Greene Co., Aurora, Ill.	B-G	Rigid-deck; mine, slope general					
Continental Conveyor & Equip. Co., Winfield, Ala.	Continental	Rigid-deck; mine, slope general					
Fairmont Machinery Co., Fairmont, W. Va.	Fairmont	Rigid-deck; mine, slope general					
Goodman Mfg. Co., Chicago 8, Ill.	Ropebelt	Ropeframe; mine, slope, surface	24-48	9-29 rope min; 23½-58 max.	1 or 2 motor tandem to 600 hp; 1 or 2 motor snub to 600 hp		Hydraulic, pneumatic, gravity
	Types 97, 98, 99	Rigid-deck; mine, slope	30-48	40½ to 53 over drive	1 motor tandem through reducer; 30, 50 & 75 hp		Chain jacks or sylvester
B. F. Goodrich Industrial Products Co., Akron 18, Ohio (with Chain Belt Co.)	Turnover	Rigid-deck; general service	All std.		Various		Various
Hewitt-Robins Inc., Passaic, N. J.	Hewitt-Robins	Rigid-deck; mine, slope, surface	14-72	12-in min to top of frame or deck	Head snub, internal snub, int. tandem, dual pulley, dual motor; up to 200 hp, 1 motor; 400 hp, 2 motors	To 850	Vertical grav., hor. grav. or ratchet, screw (tail or internal), internal hydraulic
	Rope Stringer	Rope frame; mine, slope, surface	24-48	8½-in+ (min) to rope	Head snub, int. snub, int. tandem, dual pulley, dual motor; 200 hp, 1 motor; 400 hp, 2 motors	To 850	Vert. grav., hor. grav. or ratchet, internal hydraulic, pull jacks
	X-Tensible	Rope frame	Miner service; 20 ft bridge travel on 24-in unit				
	Flexible Shuttle	Rope-connected status	Miner service, stands aligned and pulled by wire ropes				
Jeffrey Mfg. Co., Columbus 16, Ohio	Jeffrey wire-rope	Rope frame; mine, slope, surface	30-48	3 adj. ranges: 9-14; 14-24; 21-36	Tandem		Jacks
	Jeffrey	Rigid-deck; mine, slope, general	14-72		Various, as determined by application		Various, as determined by needs and conditions
Joy Mfg. Co., Pittsburgh 22, Pa.	Joy MTB-O, MTB-1, MTB-3	Ropeframe, rigid-deck; mine, slope, surface	24-48		Gear-driven tandem, 16-24-in pulleys; 25-75 & 50-150 hp	500-850	
	Model "C"	Ropeframe, rigid-deck; surface	18-48		Snub drive, 12-24-in pulleys; 3-60 hp	400-650	
	Extensible XB24, XB30, XB36	Ropeframe; continuous miner service	24-36		25-50 hp (60 AC)	400-500	
	Ready-Span	Prefabricated; pipe-frame	All std.	24 & 42	Torque-arm snub		Hor. or vert. gravity
Kanawha Mfg. Co., Charleston 26, W. Va.	Kanawha	Rigid-deck; general service	All std.		Various		Various
Link-Belt Co., Chicago 1, Ill.	Link-Belt	Rigid-deck; mine, slope, general	To 84		Various, as determined by application		Various as determined by application
	Pre-Bilt	Prefabricated components	18-36	24 & 42	Gearmotor snub; built-in back-stop		Vert. grav. or screw
Lippmann Engr. Works, Inc., Milwaukee 14, Wis.	Lippmann	Rigid-deck; general service					
Long-Airdox Co., Oak Hill, W. Va.	Lo-Rope	Ropeframe; mine, slope, surface	24-48	25¼ to 52 for drive; 9-14 to 17-24 for rope	Snub, tandem, 3-pulley tandem; to 25 to 125 hp	600	Mine; internal pneumatic; surface; grav., screw
McNally-Pittsburg Mfg. Corp., Pittsburg, Kan.	McNally	Rigid-deck; mine, slope, general					
	Cradle Idler	Pipe-frame; mine, slope, general	18-60	31½ to 39½ to top frame;	Motoreducer, shaft-mounted reducer, dual-motor		
	Cradle Pre-engineered	Pipe-frame	18-36		Various		Various
	Wire-rope	Ropeframe; mine, slope, surface	18-60	30½ to 39½ to rope	Various		
Pioneer Engr. Div., Poor & Co., Minneapolis, Minn.	Continu-flu	Prefabricated; truss, channel; surface	18-42	24 & 42	Torque-arm, V-belt, gear-motor-chain		Hor. or vert. grav., screw
Stephens-Adamson Mfg. Co., Aurora, Ill.	S-A	Rigid-deck; mine, slope, general	18-60		Various, as determined by application		Various as determined by application
Webster Mfg. Co., Tiffin, Ohio	Webster	Rigid-deck; mine, slope, general	To 72		Various, as determined by application		Automatic counter-weight, screw
	Webster special	portable, extensible, other					

Portable and Stacking Conveyors

Barber-Greene Co., Aurora, Ill.
Hewitt-Robins Inc., Passaic 1, N. J.
Link-Belt Co., Chicago 1, Ill.
Lippmann Engineering Works, Milwaukee 14, Wis.
Pioneer Engineering, Div. Poor & Co., Minneapolis 14, Minn.
Stephens-Adamson Mfg. Co., Aurora, Ill.

Tramp-Iron Removal

Dings Magnetic Separator Co., Milwaukee 46, Wis.
Eriez Mfg. Co., Erie, Pa.—Eriez magnetic pulleys.
Indiana General Co., Valparaiso, Ind., Stearns Index V permanent-magnetic pulleys; Stearns electromagnetic pulleys.
Magnetic Engineering & Mfg. Co., Clifton, N. J.—Memco permanent magnetic pulleys and suspended magnets.

Underground Belt Specialties

CRAWLER-MOUNTED PULLERS

Hewitt-Robins Inc., Passaic, N. J.

BELT WINDERS

Hewitt-Robins Inc., Passaic, N. J.
Long-Airdox Co., Oak Hill, W. Va.—"Hy-Winder."

PULL-CORD CONTROL

Cheatham Electric Switching Device Co., Louisville, Ky.
Ensign Electric & Mfg. Co., Huntington, W. Va.—"Ensign"
Schroeder Bros. Corp., McKees Rocks, Pa.—"Jabco."

ROLLER SWITCHES

Ensign Electric & Mfg. Co., Huntington, W. Va.
General Electric Co., Schenectady 1, N.Y.
Goodman Mfg. Co., Chicago 9, Ill.
Joy Mfg. Co., Pittsburgh 22, Pa.
Westinghouse Electric & Mfg. Co., Pittsburgh 30, Pa.

MOTORIZED HEAD PULLEYS

J. D. Christian Engineers, San Francisco 10, Calif.

BEARINGS, PILLOW BLOCKS

Ahlberg Bearing Co., Chicago 32, Ill.
Bantam Bearings Div., Torrington Co., South Bend 21, Ind.
Bearing Service Co., Pittsburgh 13, Pa.
Bearings, Inc., Cleveland, Ohio.
Chain Belt Co., Milwaukee 1, Wis.
Continental Conveyor & Equipment Co., Winfield, Ala.

Dodge Mfg. Corp., Mishawaka, Ind.
Fafnir Bearing Co., New Britain, Conn.
Federal Mogul Service, Div. Federal-Mogul-Bower Bearings, Inc., Detroit 13, Mich.
Hewitt-Robins Inc., Passaic 1, N. J.
Hyatt Bearings Div., General Motors Corp., Harrison, N.J.

Jeffrey Mfg. Co., Columbus 16, Ohio
Joy Mfg. Co., Pittsburgh 22, Pa.
Link-Belt Co., Chicago 1, Ill.
Marlin-Rockwell Corp., Jamestown, N.Y.
McNally-Pittsburg Mfg. Corp., Pittsburg, Kan.
New Departure Div., General Motors Corp., Bristol, Conn.

Norma-Hoffman Bearings Corp., Stamford, Conn.
Rollway Bearing Co., Syracuse 4, N. Y.
SKF Industries, Inc., Philadelphia 32, Pa.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Webster Mfg. Co., Tiffin, Ohio
T. B. Wood's Sons Co., Chambersburg, Pa.

Conveyor Pulleys and Idlers

	Pulleys—Models & Diameters					Std. Carrying Idlers 20 Deg Unless Noted		Cushion	Training	Std. Return Idlers Flat	Cushion	Training	Rubber- Tread	Beater
	Welded	C. I.	Duct Iron	Slatted, Fluted Wing	Idlers, Limer or Flexible	Idlers, Ropeframe	Troughing Light duty, L. D.; Med., M. D.; Nor., N. D.; Heavy, H. D.							
American Pulley Co., Philadelphia 29, Pa.	HD, 6-60; L, 6-12													
Continental Conveyor & Equipment Co., Win- field, Ala.	6-60	10-60		10-42		TG, UST (N. D., H. D., 20, 35, 45 deg); PBR, PBS (L. D.)	TG, UST, Rubber- tired	TG, UST	TG, UST			Anti- friction		
Dodge Mfg. Co., Mishaw- aka, Ind.	Taper- Lock, 6-60													
Goodman Mfg. Co., Chicago						Uncradled: Full-Flex low-rope; Full-Flex linked; Cradled:	Type R (rigid-deck or rope)	Impact (rigid-deck or rope)	Self-train- ing (rigid- deck or rope)					
Hewitt- Robins, Inc., Passaic, N. J.		Jones 6-72			130 rubber spiral	L-140, L-240, L-220; rigid- framed	Series 100, 200, 200; (M. D., H. D.); Series 300, 400 (H. D.); 35 & 45-deg troughing, Series 200 & 300; also Style S-25, S-26 (N. D.); Style 27 (H. D.), 20 & 35 deg.	Series 100, 200, 300 Rubber- disc; Style S	Series 100, 200, 300; Style S	Series 100; Style S		Series 300; Style S	Series 300, Style S Rubber disc	
Jeffrey Mfg. Co., Columbus 16, Ohio	Plain & Taper- Lock hubs, 10-36	5-72		10-42		Rigid- framed, offset rolls	Reliance, Defiance, Permaseal; Reliance 45-deg; Type BB (ball-bearing)							
Joy Mfg. Co., Pitts- burgh 22, Pa.						Limberoller; rigid-framed	Tru-Line Precision-Bearing							
Link-Belt Co., Chicago 1, Ill.	L-B, 6-60	L-B, 6-60		L-B			Series 5000 (L. D.); Series 6000 (M. D.); Series 7000, 8000, 9000 (H. D.); 45-deg, Series 6000, 7000, 8000; variable, Series 8000, 9000	All series except 6000, 20-deg; only 7000 & 8000, 45-deg.	All series except 6000	All series	Series 8000, 9000	All series but 5000	Series 8000, 9000	Series 8000, 9000
Long-Airlex Co., Oak Hill, W. Va.						27- & 20- deg, rigid- framed, offset rolls								
Lippman Engineering Works, Mil- waukee, Wis.	Lippman			Lippman			Everseal							
McNally- Pittsburg Mfg. Corp., Pittsburg, Kan.					Cradle, 20- & 30-deg	Cradle, rigid- frame								
Pioneer Engr., Div. Poor & Co., Minne- apolis 14,							Continuflow							
Stephens- Adams Mfg. Co., Au- rora, Ill.	Curve- Crown, 10-60						745, 755 & 220 series; 640 series (H. D.); also 35- & 45-deg	R711-226	Auto-tilt carriers, ST automatic	All series		Style ST	Style 226	Spiral- rubber
Webster Mfg. Co., Tiffin, Ohio	Webster, 12-36	Webster, 12-60		Webster, 6-40			Type 32 (N. D.); 32 H (H. D.); Life Seal; Series 156 (M. D.)	Type 32, Type PI (semi- pneumatic)	Type 32; Life Seal	All series			Rubber- disc	
T. B. Wood's Sons Co., Chambers- burg, Pa.		Woods, to 96	Woods, to 96											

design and installation of the conveyor and continues through operation. Summaries of the steps leading to a minimum of belt wear and damage appear elsewhere in this section. In addition a powerful damage and wear preventer is regular inspection by qualified personnel.

As a general rule the conveyor patrolman should check the belt each day for signs of damage. Properly trained a man can patrol 1½ to 2 mi of belt per shift. His duties should include lubrication of drives and idlers, maintenance of belt and conveyor-frame alignment, detection of sticking

rollers, etc., and maintenance of a clear right-of-way.

A more thorough inspection by a supervisor or specialist should be made weekly. An even more comprehensive check should be made quarterly and should include not only the belting but also machinery and parts.

Belt Conveyors and Belting

Conveyor Belting—Mine, Hoisting

Fabric and treatment code: Cotton, C; Nylon, N; Rayon, R; Steel, S; Cord, Cd; Heavy-duty nylon fill, HDNF; Synthetic, Syn; M, mildew.

	Brand Name	Application	Type	Fabric	Covers, Impregnation USBM No.	Width, In	Overall Thickness, In	Wt, Lb per Lin Ft	Max. Working Tension, Lb per In or — per Vulc. Splice	Tension in Ply — Mech Fasteners	Fastener Holding Ability, % Belt Strength	Surface Coeff. of Friction	Speed, FPM Max.	Capacity, TPH Max.	Min. Pulley Diameter — Head-Drive	Tail
Acme-Hamilton Mfg. Corp., Trenton, N. J.	Pyroprene	Mine, slope	Plied	C, CN	Neoprene, 28-7	24-60					50		700			
	King Koal Super Service	Mine, slope, surface	Plied	C, CN	Rubber	24-60					50		700			
Boston Woven Hose & Rubber Co., Boston 3, Mass.	Flameout	Mine, slope	Plied	C, CN, M, O	28-9	24-60			To 70	To 60	.40		500-650			
	Colliery King	Mine, slope, general	Plied	C, CN, M		24-60			To 70	To 60	.40		500-650			
	Haul King	Mine	Solid-woven	NC, M		24, 30, 36, 42				200	.40		500-600			
	Flameout 200	Mine	Solid-woven	NC, M, O	28-9	24, 30, 36, 42				200	.40		500-600			
	BostRon	Mine, slope, general	Plied	Syn, M, O	28-9	24-60			To 150	To 90	.40		500-650			
B. F. Goodrich, Ind. Products Co., Akron 18, Ohio	Caricoal F. R. Caricoal*	Panel	Plied, 3-5	C, CN, R, C & R, Cd	Rubber, Neoprene* 28-6	24-36	$\frac{1}{4}$ - $\frac{9}{16}$	4.0-9.5	35-60	25-50	50	.27-.36	600+	750	12	6
	Caricoal Nylock F. R. Nylock* Koroseal Nylock**	Panel	Solid-Woven	CN	Rubber, Neoprene* PVC** 28-6	24-36	$\frac{1}{16}$ - $\frac{7}{16}$	3.7-7.0		200	50	.27-.36	600+	750	12	6
	Caricoal F. R. Caricoal* Super Longlife	Main-line	Plied, 4-7	C, CN, R & RN, C & R, Cd	Rubber, Neoprene* 28-6	30-48	$\frac{1}{16}$ - $\frac{11}{16}$	6.0-17.5	60-75	50-60	50	.27-.36	700	1,650	24-42	20-36
	Longlife Fire Res.* Super Long-life	Slope	Plied, 4-10	C, CN, R & RN, C & R, Cd, S	Rubber, Neoprene*	30-72	$\frac{1}{8}$ - $1\frac{1}{4}$	8.0-43.2	60-200, 900-3,000 st. cable	50-90	50	.27-.36	700	4,265	24-60	20-54
	Long Life, Oil Service* Super Long-life	Surface, general	Plied, 4-10	C, CN, R & RN, C & R, Cd, S	Rubber, neoprene* hycar*	12-72	$\frac{3}{8}$ - $\frac{3}{4}$	2.2-17.5	35-60 900-3,000 st. cable	25-90	50	.27-.36	600-700	1,650-3,850	18-42	12-36
	Longlife Nylock O. S. Nylock* Super L. N.	Surface, general	Solid-woven	CN	Rubber, Neoprene*	24-48	$\frac{1}{32}$ - $\frac{1}{2}$	3.7-12.0		200	50	.27-.36	600	1,450	16	12
	Goodyear Tire & Rubber Co., Akron 16, Ohio	Uniflo	Mine, general	Solid-woven	NC, O Neoprene 28-3	18-48	$\frac{3}{16}$ - $\frac{3}{8}$	1.83 & 2.30 per sq. ft.	260	210						8
Hewitt-Robbins, Incorporated, Buffalo 5, N. Y.	Coal-Flo	Mine, general	Plied, 3-6+	HDNF, R, M	Neoprene 28-3	12-72			40-75 (R) 35-75 (N)	30-55			600+			
	Style B, Stacker	Mine, general	Plied, 4-6+	C, HDNF, R, M	Rubber, neoprene	12-72			35-110	30-55			600+			
	Compass Steel Cable—high-tonnage slopes, lifts up to 1,500 ft.															
	Ajax, Mallese Cross	Mine, Slope, Surface	Plied, 2-12	C, CR, CN, R, RN, M		18-72		Typical 4-Ply Coal Belts— 4.1-24-in, $\frac{1}{8}$ - $\frac{1}{2}$ -in covers					500 or 750	30-1, 130 per 100 FPM	Typical 4-Ply Coal Belts— 20	16
	Monarch Neoprene	Mine, Slope, general	Plied, 2-12	"	Neoprene 28-2	"	$\frac{7}{16}$ - $\frac{7}{8}$	6.0-30-in, $\frac{1}{8}$ - $\frac{1}{2}$ -in 7.2-38-in, $\frac{1}{8}$ - $\frac{1}{2}$ -in							24	24
	Mineveyor PVC	Mine	Solid-woven		PVC 28-2		$\frac{17}{32}$ - $\frac{1}{2}$	10.9-42-in, $\frac{3}{16}$ - $\frac{1}{2}$ -in							24	24
	Monarch Neoprene	Mine	Solid-woven		Neoprene 28-2											
Paltech Co., New Caanan, Conn.	Ajax	Mine, slope, general	Solid-woven													
	Roulands A, B, C	Surface	Plied, 2-7	C, CN, RN	Rubber, Neoprene	12-54	$\frac{1}{4}$ - $1\frac{1}{4}$	2-26					1,100			
	Pioneer	General	Plied		Rubber			3.8-12.1		28-36						10
	Pioneer Engineering Div. Poor & Co., Minneapolis 14, Minn.															
	H. K. Porter Co., Thermold Div, Philadelphia 24, Pa.	Plasticoal	Mine, surface	Solid-woven	CN	PVC 28-11	To 36	$\frac{1}{4}$ - $\frac{9}{16}$	4.25 (30-in)	250	50		350-400 (A) 1,650 (max.)			16
Raybestos-Manhattan Inc., Passaic, N. J.	Plasticoal	"	"	"	Neoprene 28-11	To 36	$\frac{5}{16}$ - $\frac{3}{8}$	5.25-5.50 (30-in)		250	50					16
	Hercules Victor neo.	General	Plied	C, CN, M, O	Rubber, neoprene	To 72										
	Thermocoal	Mine	Plied, 4-6	C, CN, M, O	Neoprene 28-11	To 72										
	Coal mover	Mine			Neoprene 28-10											
	Ray-Man (also F. R.)	Mine, general	Plied, 4-9	N, NCd, M	Rubber, neoprene				170-1,440	160-675	(Designed for up to 45-deg idlers)					18-66
Russell Mfg. Co.—W. Va. Belt Sales, Inc., Mt. Hope, W. Va.	Homoflex (also F. R.)	General	Plied, 4-8	CN, M	Rubber, neoprene				140-1,200	120-800						20-84
	Homocord (also F. R.)	General	Plied, 4-6	C & CCd	Rubber, neoprene				160-360	120-300						
	Rusion 16	General mine	Solid-woven	NC, M, O	PVC 28-25	24-42	$\frac{11}{32}$ - $\frac{1}{2}$	1.94 per sq. ft.		200	50-75	.63				8
	Rusion 17	Extensible conveyors	"	"	"	30	$\frac{1}{4}$	1.77 per sq. ft.		200	50-75	.63				8

and Surface Applications

inhibited; O, oil-resistant. Capacities are for 20-deg idlers.

Brand Name	Application	Type	Fabric	Covers, Impregnation, USBM No.	Width, In	Overall Thickness, In	Wt. Lb per Lin Ft	Max. Working Ten-sion, Lb per In or Vulc. Splice	Fastener Mech Fasteners	Holding Ability, % Belt Strength	Surface Coeff. of Friction	Speed, FPM Max.	Capacity, TPH Max.	Min. Pulley Diameter In
Scandura Inc.—National Mine Service Co., Pittsburgh 19, Pa.	Gold Line	Panel, M. L., surface	Solid-woven	N, M, O	PVC 28-1	6-48	1 1/4	5.8	210	75-80	.59	600		8
	Gold Line Heavy Duty	M. L., slope, surface	"	"	"	18-48	3/4	7.3	320	75-80	.59	600		12
	Thin Line	Extensible conveyors	"	"	"	6-48	9/16	4.7	170	75-80	.59	600		6
United States Rubber Co., New York 20, N. Y.	Giant Minehaul F. R. Mine-haul*	Mine, slope, surface	Piled, 4-6	C, R, CN, N, M	Rubber, neoprene* 28-5				132-420	120-360				
	Burro	Mine, surface	Solid-woven	Syn & Cold R, nat. yarns	neoprene, 28-5	18-48								

Hoppers and Feeders, Shuttle Car to Belt

DEMOUNTABLE—TAIL, INTERMEDIATE

Goodman Mfg. Co., Chicago 9, Ill.
Jeffrey Mfg. Co., Columbus 16, Ohio.
Joy Mfg. Co., Pittsburgh 22, Pa.

COMBINED WITH TAIL TERMINAL

Goodman Mfg. Co., Chicago 9, Ill.
Hewitt-Robins Inc., Passaic, N. J.
Jeffrey Mfg. Co., Columbus 16, Ohio.
Joy Mfg. Co., Pittsburgh 22, Pa.
Long-Airdox Co., Oak Hill, W. Va., wheel and skid mounted.

CRAWLER-MOUNTED

Hewitt-Robins Inc.—Mobile tail-loading hopper.

DIFFERENTIAL RATE

Columbus-McKinnon Corp., (Schroeder Bros. Corp., McKees Rocks, Pa.)—"Ratio-Feeder."
Goodman Mfg. Co., Chicago 9, Ill.—Shaker feeder.

Holidaysburg Machine Div., Berwind-White Coal Mining Co., Holidaysburg, Pa.—"Holidaysburg."

Jamison Feeder, Inc., Hunkers, Pa.—"Jamison."
Joy Mfg. Co., Pittsburgh 22, Pa.
National Mine Service Co., Pittsburgh, Pa.—"TransFeeder."

DIFFERENTIAL RATE WITH ROTARY BREAKER

Long-Airdox Co., Oak Hill, W. Va.—Model 3891 belt feeder and rotary pick breaker.

Splicing, Repair, Materials

FASTENERS AND TOOLS

Armstrong-Bray & Co., Chicago 30, Ill., "Plategrip, Hinged Plategrip separable."
Crescent Belt Fastener Co., New York 16, N. Y., "Crescent."
Flexible Steel Lacing Co., Chicago 44, Ill., "Flexco, Flexco hinged."
General Splicing Corp., Yonkers, N. Y., "Minet hinged."
National Mine Service Co., Pittsburgh 19, Pa., "Hayden."
Talcott, Inc., Providence 1, R. I.

MECHANICAL SPLICES

Raybestos-Manhattan Inc., Passaic, N. J., "Wedlok."

VULCANIZED REPAIR MATERIALS, TOOLS

B. F. Goodrich Industrial Products Co., Akron 18, Ohio.
Goodyear Tire & Rubber Co., Akron 16, Ohio
Hewitt-Robins Inc., Passaic, N. J.
Linatex Corp., Stafford Springs, Conn.
Tempil Corp., New York 10, N. Y., "Tempilstik" vulcanized temperature indicator.
U. S. Rubber Co., Passaic, N. J.

Trippers, Cleaners, Takeups, Backstops

	Trippers			Takeups			Backstops		
	Hand Positioned	Belt Propelled	Self-Powered	Stationary Plows	Traveling Plows	Belt Wipers	Belt Brushes	Screw	Roller type
Continental Conveyor & Equipment Co., Winfield, Ala.	✓	✓				✓	✓	✓	✓
Dodge Mfg. Co., Mishawaka, Ind.							✓		
Formsprag Co., Warren, Mich.									✓
Goodman Mfg. Co., Chicago 9, Ill.								✓	
Hewitt-Robins Inc., Passaic 1, N. J.	✓	✓	✓			✓	✓	✓	✓
Jeffrey Mfg. Co., Columbus 16, Ohio	✓	✓	✓	✓	✓	✓	✓	✓	✓
Link-Belt Co., Chicago 1, Ill.	✓	✓	✓	✓	✓	✓	✓	✓	✓
Marland One-Way Clutch Co., La Grange, Ill.									✓
Pioneer Engineering Div. of Poor & Co., Minneapolis 14, Minn.					✓	✓	✓	✓	✓
Stephens-Adamson Mfg. Co., Aurora 8, Ill.	✓					✓	✓	✓	✓
Webster Mfg. Co., Tiffin, Ohio	✓	✓	✓	✓	✓	✓	✓	✓	✓

VULCANIZERS

Heintz Mfg. Co., Cleveland 35, Ohio.

VULCANIZED SPLICING SERVICE

B. F. Goodrich Industrial Products Co., Akron 18, Ohio.
Goodyear Tire & Rubber Co., Akron 14, Ohio, "Goodyear Measured Tension splice, Diamond splice."
U. S. Rubber Co., Passaic, N. J.

BELTING REPAIR SERVICE

Conveyor Belt Service, Inc., Virginia, Minn.
Reid Belt & Rubber Co., Bluefield, W. Va.
W. Va. Belt Repairs, Inc., Mt. Hope, W. Va.

COLD REPAIR MATERIALS, KITS

Automatic Vulcanizers Corp., New York 13, N. Y., "Pang."
General Splice Corp., Yonkers, N. Y., "Minet."
Magic Chemical Co., Brockton, Mass., "Magic-Vulc."
Rema-Tech, Inc., New York 16, N. Y., "Rema Tip-Top."
U. S. Rubber Co., Passaic, N. J., "U. S. Holdtite."

BELT CLAMPS, TIGHTENERS

Flexible Steel Lacing Co., Chicago 44, Ill., "Far-Pul."
Hewitt-Robins Inc., Passaic, N. J.
General Splice Corp., Yonkers, N. Y., "Minet."
Pioneer Engineering Div., Poor & Co., Minneapolis 14, Minn.

MECHANICAL REPAIR—Either regular plate-type fasteners or special repair plates may be used for repairing tears or in replacement of worn or soft sections. Rip plates, for example, are usually a third longer than regular plate-type fasteners and have a third bolt in the center to keep the plates flat. Because of this extra length rip plates must always be used crosswise of the belt to prevent trouble at the pulleys. Where plates must run lengthwise of the belt, as in replacing a worn section, the shorter regular fasteners should be employed.

VULCANIZED REPAIR—Where repairs of the vulcanized type are made depends in part on the type of belt. Main slope, or main surface or underground belts normally are made endless and are difficult to remove. Consequently, most repairs are made with the belt in place. Repairs also

Troubleshooting Cover Damage

Belt edges worn or gouged	Rubbing	Realign belt if necessary. Remove all obstructions
	Off-center loading, misalignment, defective self-aligning idlers	Reposition loading and transfer chutes. Align belt. Repair or replace faulty idlers. Paint edge with self-curing cement to limit moisture absorption
Excessive top-cover wear	Poor cover quality	Replace with heavier cover or higher-quality rubber
	Slow-running, stuck or misaligned return rolls	Clean belt and keep clean with belt cleaners. Service and realign return rollers. Use rubber-disc return rolls if necessary
	Excessive sag between idlers; coal works or shuffles	Check tension—increase if too low. Reduce idler spacing and/or graduate, particularly at loading end
	Abrasive skirt boards	Use rubber skirt material, not old belting
	Poor loading	Feed coal onto belt in same direction and at same speed
	Pileup at head and tail pulley	Keep clean. Load properly
Top-cover damage—gouging, grooving, ripping or stripping	Stiff skirt seal riding on belt	Use more-pliable seals. Do not use old belt
	Excessive openings between belt and seals	Adjust to minimum clearance. Decrease idler spacing and/or graduate, particularly at loading end
	Material trapped under skirts as a result of belt dropping down under load weight or loading impact	Use cushion or pneumatic idlers to keep belt up. Decrease idler spacing and/or graduate, particularly at loading end
	Chute lips and skirts too close to belt; no gap increase in direction of belt travel	Prevent jamming by providing a gap of at least 1 in increasing in travel direction
	Coal jams in chute	Redesign chute for proper angle and width
	Coal jams under chute	If along belt line, provide hinges so chute can swing up. At end install baffles or improve loading to prevent pileup back of chute
	Tramp-iron puncture or rip	Use rip protector, magnetic removal equipment or detector interlocked with driving motor. Short surge belt ahead of say, main slope belt, worth consideration—wire-inserted belt to prevent long rips
Bottom-cover wear	Drive-pulley slippage	Adjust screw takeup or counterweight to increase tension. Lag drive pulley (grooved lagging if wet). Increase arc contact with snub pulley or tandem drive. Raise belts speed at same loading rate
	Sticking rollers	Service and lubricate properly
	Excess troughing-idler tilt	Not over 2 deg from upright
	Bolt heads protruding above lagging	Tighten bolts. Replace worn lagging. Use vulcanized-on lagging
	Material buildup due to spillage or other reasons	Use good chute-loading facilities. Do not load belt too heavily. Deck under top run. Use plows or scrapers ahead of tail pulley on return run. Use plate or vulcanized splices to check leakage. Inspect and clean up regularly
Shrinkage	Moisture	Splice in extra piece with takeup half down. Check belt design for possible increase in tension
Bowing up in center	Oil	Eliminate oil source or use oil-resistant belt. To relieve condition in existing belt, groove lengthwise with tire-grooving tool or turn belt over, carrying side down
Spot swelling or lengthwise strip swelling of bottom cover; bottom-cover separation	Oil	Avoid overlubrication and spillage of oil and grease
Blister in cover	Fine material working into cuts or punctures	Spot repair, vulcanizing or "cold"-type self-curing repair material
Unusual wear of pulley lagging	Drive-pulley slippage	Increase slack-side tension to point where slippage is eliminated—never exceeding maximum belt rating. Increase belt wrap on pulley. Increase belt speed to reduce required effective tension

Troubleshooting Belt Operation

Belt runs off-center for long distances	Off-center loading	Adjust chutes and other loading devices to put load in center in direction of belt travel
Belt runs off-center at a specific point or climbs sideways on same idlers	One or more idlers immediately ahead of trouble point not square	Advance end of idler to which belt has shifted in direction of belt travel
	Conveyor frame not straight	Straighten, using stretched string to determine how much
	Idler stand or stands not centered	Same correction
	Idlers stick	Lubricate properly
	Loose idler	Reposition and fasten securely
	Low conveyor side	Level up and secure
	Material builds up on idlers or terminal pulleys	Improve maintenance; install belt-cleaning equipment; lag pulleys
Belt runs off at terminal	Pulley or approaching idlers not square	Align properly
	Pulley built up	Clean pulley
Specific section of belt runs off-center all along conveyor	Crooked belt as a result of storage of telescoped rolls or with one edge close to damp ground or wall; stretching of worn edge because of high tension, or shrinkage from moisture absorption	If "bow" is in new belt, it may disappear when belt is broken in. In belts in service eliminate cause of bowing; if impossible, replace with new section. Increase tension, checking first to see if allowable belt tension will permit
	Joint not square in mechanical splice or steps not matched in vulcanized splice	Resplice, being sure to square ends or match properly with vulcanized type
Belt wanders at random	Too stiff because of design	Use belt with more transverse flexibility or add extra aligning aids and tilt troughing idlers ahead not over 2 deg
	Too stiff because of newness or cold weather	Allow proper break-in time. Speed up by letting belt stand loaded overnight
Surface belt runs off-center at certain times	Wind pressure and effect of sun on side of steel conveyor frame	Use covers or wind deflectors, plus self-aligning idlers. Use reflective point on frame
Belt stretches excessively; splices weaken prematurely; cuts or breaks enlarge quickly	Excess starting tension; excess belt tension	Increase speed, keeping tonnage the same, or reduce tonnage at same speed. Even up feeding rate. Decrease drag by proper idler lubrication, replacement of worn idlers and removal of spilled material. Lag drive pulley or increase the wrap by snub pulley or tandem or dual motor drive. Use minimum-weight counterweight. Replace with lower-elongation belt. Replace with lower-elongation or greater-strength belt

Troubleshooting Carcass Damage

Fastener pull-out	Improper starting	Stepped starting
	Excess tension	See recommendations in "Troubleshooting Belt Operation"
	Improper fasteners or fasteners not properly tightened	Use correct fasteners. Retighten new fasteners after run-in. Inspect regularly
	Mildew	Use inhibited belt
Crosswise breaks back of fasteners	Fastener plates too long	Use shorter fasteners or increase pulley size, or both. Install fasteners on angle across belt. Use hinged fasteners. Use vulcanized splice
Carcass breaks—star or edge parallel	Impact	Load at flat angle, at belt speed and in line with belt. Use cushion idlers

(Continued on next page)

Belt Conveyors and Belting

Troubleshooting Carcass Damage (continued)

Crosswise breaks with top or bottom cover intact or only bottom broken	Material trapped between belt and pulley	Plows or scrapers ahead of tail pulley on return side; deflector over take up pulley
	Material building up on pulleys	Use proper belt cleaner and rubber lag; install scraper on pulley
Crescent breaks, mushy spots	Mildew	Use mildew-inhibited belt
Crosswise breaks at edge	Belt edges folding up	Use limit switches to stop excessive shifting of belt. Remove obstructions and provide ample side clearance
	Poor positioning of idler next to head pulley — too close or too high	Relocate or readjust idler or pulley position
	Too-sharp vertical curve	Cut down curve radius to reduce stresses on idlers and belt
	Mildew	Use inhibited belt
Lengthwise carcass break, top and bottom covers intact	Belt running off and folding back	Use limit switches
	Joining of impact breaks	Reduce impact

may be made to mother, extensible and similar belts in place. However, it is a good rule to remove sections when they have suffered some casualties or wear for complete reconditioning, either in the main shop or a contract shop.

Normally, this work would be done on ply-type belts since general practice on solid-carcass belts is to let them run because they are relatively much harder to damage to any significant extent.

In belt shops, either company-owned or independent, long inspection and work tables, dryers and specialized tools result in the best in reconditioning at a minimum of cost. Procedure is basically thorough inspection, drying, major or spot repairs (hand work) on the work tables, vulcanizing and curing of repairs, and final inspection.

These basic procedures also apply to repairs made with the belt in place. These repairs may be of the heat-vulcanized type or performed with self-curing materials available in individual items or kits from a number of manufacturers, including fabric, filler material and compound for cover and fabric reconstruction. Whichever type of repair is attempted (both may be desirable at the same property depending upon the type of damage and the belt application), the secret is proper tools, proper materials and careful following of the directions or recommendations of the manufacturers.

Repair timing is important. Cuts or tears in covers and edges should be

taken care of immediately. This is especially important with carcass breaks, which are accentuated by continued operation. If the conveyor cannot be stopped immediately belt fasteners or staples should be installed to keep the situation under control until a thorough vulcanized repair can be made. Immediate repair also keeps dirt and moisture out of the fabric, and prevents enlargement of damage areas as a result of impact and sliding over idlers and pulleys. This is another sound reason for regular belt inspection.

Belt-Conveyor Safety

Steps to reduce electrical, fire and other hazards to belt and conveyor, as summarized in other sections of this Operating Guide, also contribute to the safety of men as well as preventing damage to facilities. Other recommendations for personnel safety include:

Adequate clearance, especially where men ride belts. Good clearance also is essential for inspection and maintenance work.

Guards and railings at drive and other points where men might come in contact with belt or machinery. Protection also should be provided against falling or flying material at transfer and discharge points.

Secure anchorages for head, drive, tail and intermediate sections.

Periodic checking of all fastening and hold-down bolts.

Holdbacks or electric brakes for inclined conveyors.

Stiles, bridges or underpasses at belt crossings.

Snug-fitting clothing at all times for men working around conveyors, handling supplies, and so on.

No work on the conveyor unless it is stopped and locked out, and no work on any electrical element unless the power is off.

Safety circuit lines, pull-cord switches or equivalent for emergency stopping anywhere along the conveyor line, plus, if the conveyor is used to move supplies, a control switch at the tail.

Extension grease lines.

Establishment and observance of strict rules on belt riding.

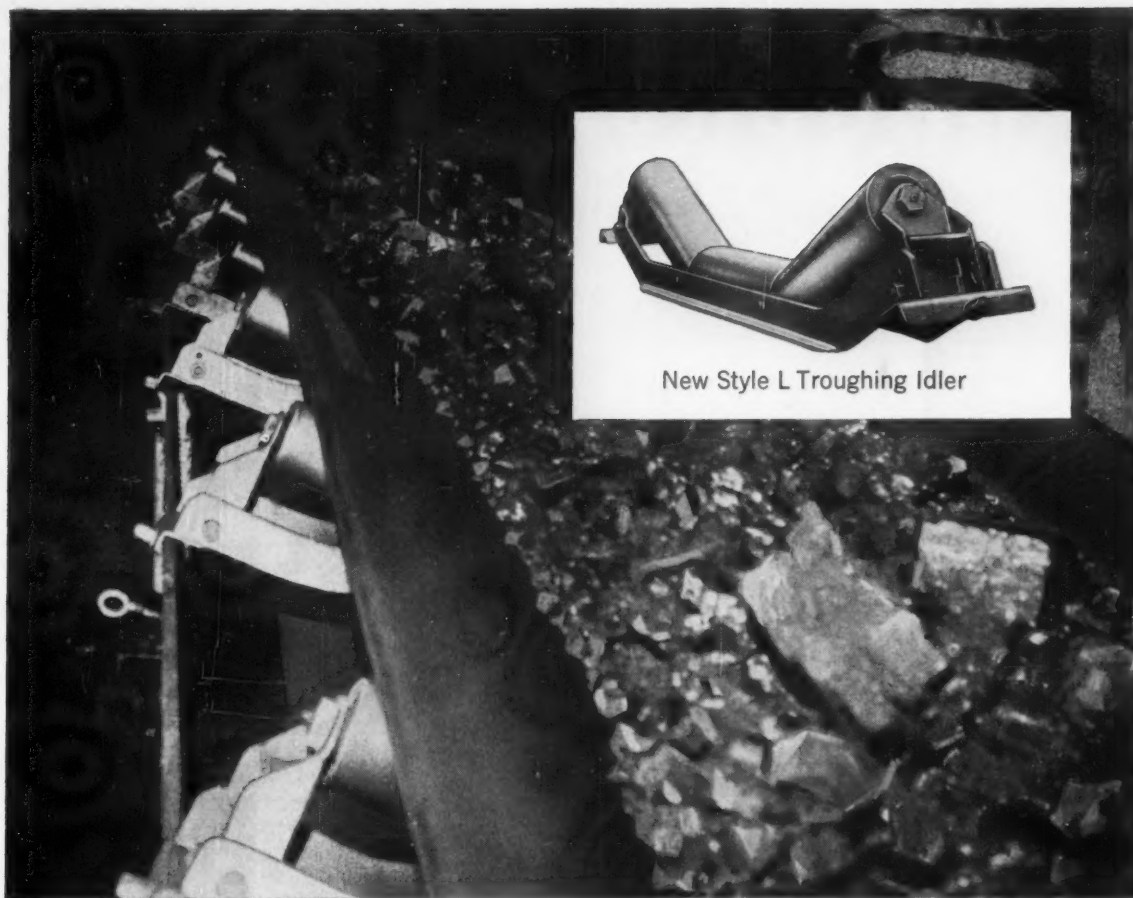
Grounding of pan lines and conveyor structures. Under no circumstances should they be returns.

Beltways clean and free of loose materials or obstructions.

Gas-mask caches at each drive, along with extinguishers, rock dust, etc., for use in fighting fire, or escape, etc., if a fire occurs.

Acknowledgment—The editors are deeply grateful to the manufacturers of conveyors, belting and auxiliaries for much of the material in this Operating Guide. Their names with the key products they offer appear in the accompanying lists.

Reprints of this Operating Guide are available and may be obtained as long as the supply lasts at a single copy price of 25c. Write The Editor, *Coal Age*, 330 West 42nd St., New York 36, N. Y.



New Style L Troughing Idler

H-R manufactures the broadest line of wire rope conveyors...

SEE ONE NOW!

Contact your H-R Field Engineer to arrange an inspection tour of an H-R wire rope conveyor installation in operation.

DESIGN RANGE:

- New Style L idlers—2 $\frac{3}{4}$ " to 6" dia.
- Belt widths of 24", 30", 36", 42", 48".
- Speeds from 250 to 650 ft./min.
- Feed rates from 125 to 2,250 TPH.
- Power ratings from 5 to 300 hp.
- Above and below ground installation.

MONEY-SAVING HINTS! New pocket-size H-R booklet, packed with useful information on mining belt conveyor operation and maintenance, gives a wealth of practical facts at your fingertips. Write Hewitt-Robins, Stamford, Connecticut. Ask for Bulletin 12-49.



THE NAME THAT MEANS EVERYTHING IN BULK MATERIALS HANDLING SYSTEMS...
CONVEYOR BELTING AND IDLERS • INDUSTRIAL HOSE • VIBRATING FEEDERS, SCREENS AND SHAKEOUTS • POWER TRANSMISSION EQUIPMENT

ANNOUNCING LE ROI'S

A new line of powerful... highly portable.

These rigs come on tires or tracks!



THE LRD-2

Here's a highly portable blasthole drill for making hole up to 4½ inches as deep as 30 feet... equipped for either positive-drive rotary drilling or powerful down-the-hole percussive drilling.

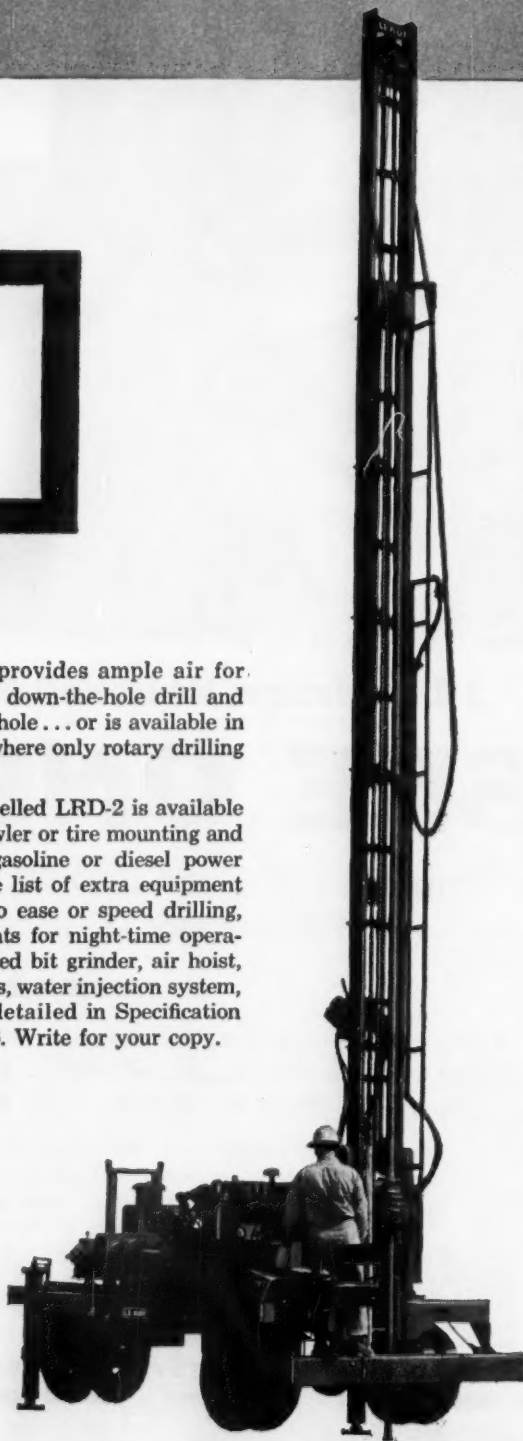
What's more, the LRD-2 is completely self-contained... and economically priced, too!

The entire unit is easily handled by one man. Controls are conveniently grouped at an operator's station located alongside the drilling area. The unit can be moved, leveling jacks hydraulically set, boom hydraulically raised, drill pipe and bits connected, and hole started — all with a few non-fatiguing motions.

Powerful direct mechanical drive keeps the rotary table turning — won't bog down or lose torque under rough going like air or hydraulic driven units — eats through tough rock formations under 10,000 lbs. pull-down pressure at speeds from 40 to 250 rpm. If necessary, a hard-hitting down-the-hole drill can quickly be substituted for the rotary bit to drill extremely hard rock formations. A Le Roi 25 hp two-stage air

compressor provides ample air for powering the down-the-hole drill and cleaning out hole... or is available in single-stage where only rotary drilling is necessary.

The self-propelled LRD-2 is available either on crawler or tire mounting and with either gasoline or diesel power unit. A whole list of extra equipment is available to ease or speed drilling, including lights for night-time operation, a mounted bit grinder, air hoist, breakout tongs, water injection system, etc. . . . all detailed in Specification Sheet AT-146. Write for your copy.



DEEPHOLE DRILL RIGS!

rotary blasthole drills

THE LRD-3

Here's the *big rig* . . . completely self-contained for putting down hole as large as 7 $\frac{3}{8}$ in. to 100 ft. depth!

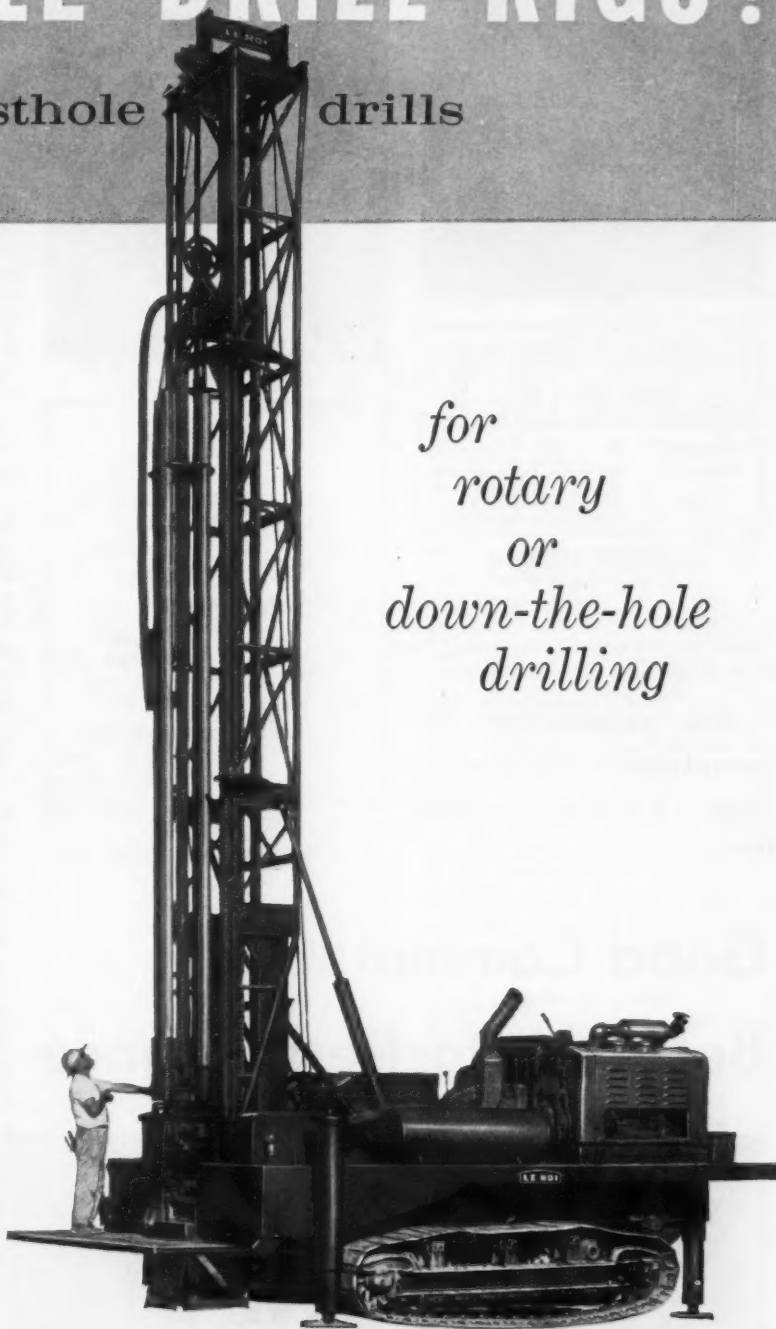
The LRD-3 is available with either crawler or truck mounting. An enclosed cab can be furnished to provide all-weather protection for the operator while drilling. All controls are conveniently grouped for easy operation and good visibility.

The traveling head design of the LRD-3 provides positive mechanical power without excessive torque loss under heavy pulldown, and permits easy control in making up and breaking down drill-rod. Every function of the unit is designed to speed productive drilling and keep the operator making hole. Leveling, raising the mast, and even the automatic drill pipe magazine are hydraulically controlled for speedy operation. A powerful dust collector traps cuttings and blows them well away from the unit.

An extra-sturdy 4-speed chain-hydraulic pulldown puts up to 30,000 lbs. of pressure on the bit of the LRD-3. A rugged dual-range transmission provides rotary speeds from 9 to 168 rpm in a selection of 10 forward and 2 reverse speeds.

Where needed, the rotary bit can be quickly changed for a powerful down-the-hole drill. A Le Roi 100 hp dual-manifold air compressor provides plenty of 100 psi air for punching through tough rock with the down-the-hole drill, or it can be set to deliver 625 cfm of 40 psi air for fast, efficient removal of cuttings in rotary operation.

The LRD-3 comes complete with a hydraulically operated magazine with capacity for four 20 ft. drill pipes, and can be equipped with optional convenience equipment similar to the LRD-2. Specification Sheet AT-147 describes the unit in detail, with complete spec information. Send for a copy.



*for
rotary
or
down-the-hole
drilling*



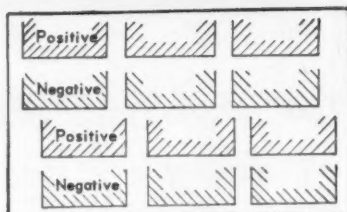
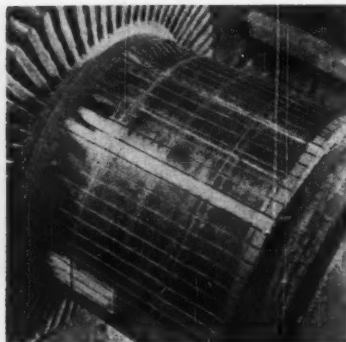
LE ROI

division of Westinghouse Air Brake Co.

Sidney, Ohio

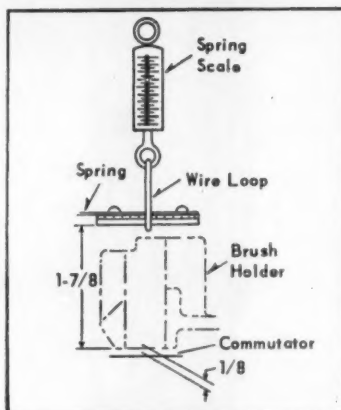
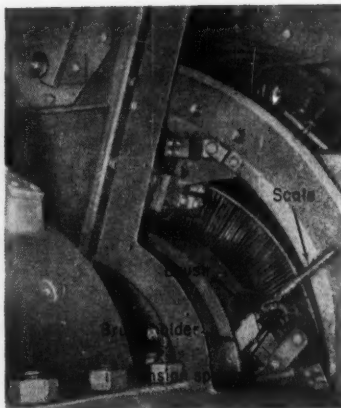
Distributed in the Coal Fields by: Acme Machinery Company, Huntington, West Virginia, and Equipment Service Company, Inc., Birmingham, Ala.

Maintenance Ideas



CORRECT METHOD
of staggering brushes.

New materials have improved commutators but maintenance is still the controlling factor.



PROPER WAY
to measure spring tension.

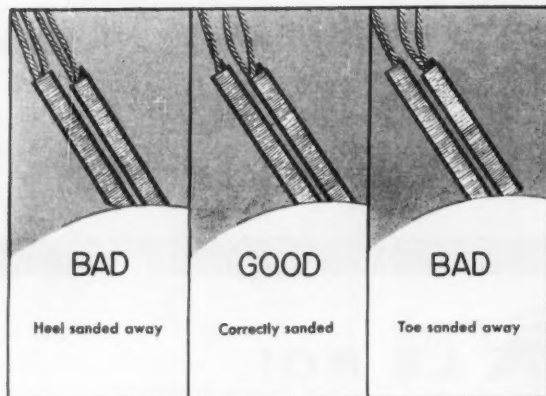
MAINTAINING GOOD COMMUTATION is the most important electrical factor of DC machines. Bearing maintenance, discussed in the November, 1960, issue of *Coal Age Maintenance Ideas*, is the most important mechanical factor.

We assumed in the bearing-maintenance article that bearings are designed to give the best-possible performance when they leave the factory. We also can be certain that manufacturers produce machines that will provide good commutation. The problem is to see that they remain that way. One of the best ways is to make sure that commutators receive proper care and attention after motors are placed in service. To do this motor-maintenance men must know what factors are required to produce good commutation. Articles which have appeared in *Westinghouse Maintenance News* cover the subject well. Three of these articles are presented here in condensed form to give you a better understanding of commutation—the right way of achieving long life for your motors.

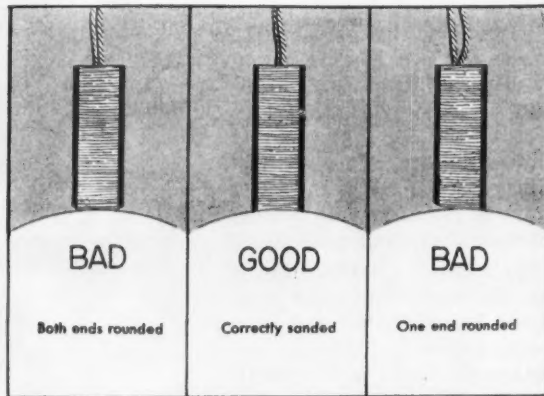
Selective Action

One of the biggest problems of commutator maintenance is selective action. This is the condition which results when the brushes on a machine do not divide the load equally with the result that there is distress to the commutator or ring surface and rapid, unequal brush wear. The distress to a commutator surface usually is a threaded or streaked condition which progresses in a cumulative manner. However, in some

Good Commutation: Better Motor Performance



REACTION BRUSHES



RADIAL BRUSHES

extreme cases of selective action one brush or one group of brushes can become overloaded to the extent that they actually start to burn.

Symmetry—The magic word in operating a machine without encountering selective action is symmetry. The electrical connections that are paralleled must be of a uniform potential. This includes the sliding connection between the brush and the commutator or slip-ring surface. The potential between a brush and a commutator or ring surface is called contact drop.

The contact drop is influenced by brush grade, pressure, and fit, plus the condition of the film on the commutator or ring surface.

Some brush grades have film-forming properties; others have various degrees of cleaning action. Brushes which establish a film have a higher drop than brushes with cleaning action added to prevent the buildup of a film, assuming that atmospheric conditions are the same for each. Since the contact drop varies between brush grades it is not good practice to mix grades on one machine. Brushes with the lowest drop will take more than their share of the load. This can progress to the extent that on one machine some brushes will be overloaded while a light-load running condition can exist on others.

Sometimes brush grades on a machine are mixed intentionally. This may be done when it is necessary to add cleaning action to overcome some bad atmospheric conditions. Where it is considered desirable to add cleaning brushes they should be added in a symmetrical pattern so that the number of cleaner brushes in any one arm and in any one brush path is uniform. In cases where the number of brushes per arm and the number of arms are not in the right ratios it is impossible to come out exactly even, but the ratio should be held as close as possible.

Brush Pressure—Variations in brush pressure cause differences in contact drop, resulting in selective action. The first thing to consider in adjusting brush pressure is the spring. If a brushholder is overloaded the resulting high temperature can anneal the springs, reducing spring pressure. Also pressure springs can fatigue, particularly if they have been operated on an extremely

rough commutator. The spring pressures should be periodically checked and set at the value recommended by the machine manufacturer. A spring scale equipped with a leather or wire loop to slip under the pressure finger should be used. The pull should be taken in the direction of brush motion to avoid values different from those affecting the brush in operation. Dividing the tension by the cross-sectional area of the brush in square inches give the brush pressure per square inch. Normal pressure values for various types of machines follow this general pattern:

Machine Type	Pressure, PSI
Industrial DC machine	2-2½
High-speed exciters	2½-3
Diesel generators	4½-6½
Axle-hung traction motors	6-12
Spring-suspended traction motors	5
Auxiliary diesel generators	2½-5½

Brush Clearance—Brushholders whose clearances are too large or too small also can affect the pressure of the brush on the commutator. Large tolerances are only troublesome in radial brushes in reversing service, where too much play will permit double faces to form on the brushes. This condition causes excessive arching due to the narrower effective brush face and the resulting change to the commutator zone, as well as selective action resulting from variations to the contact drop.

Brushholders which are too snug cause the brushes to be held up. This effectively lowers the pressure of the brush on the surface, causing a variation in the contact drop and resulting in selective action.

The standard tolerance for brush thickness is plus 0.000 to minus 0.004 and for brush width is plus 0.000 to minus 0.004 for brushes under ¾ in wide and plus 0.000 to minus 0.015 for brushes over ¾ in wide. The average industrial type brushholder maintains a tolerance of plus 0.003 to plus 0.006 on thickness and plus 0.002 to plus 0.010 on the width dimension.

If your maintenance checks indicate clearances outside these limits the brush and brushholders should be checked. Look for brushholders that have been warped by a flash or overheating. Look for burrs or dirt inside the holders.

Brush Fit—When installing new brushes every precaution should be taken to insure that the brush fit is uniform and that they make contact over the entire face. After the brushholders have been checked for proper adjustment the brushes should be seated by drawing a sheet of sandpaper under the brushes in the direction of rotation while pressing them firmly against the commutator.

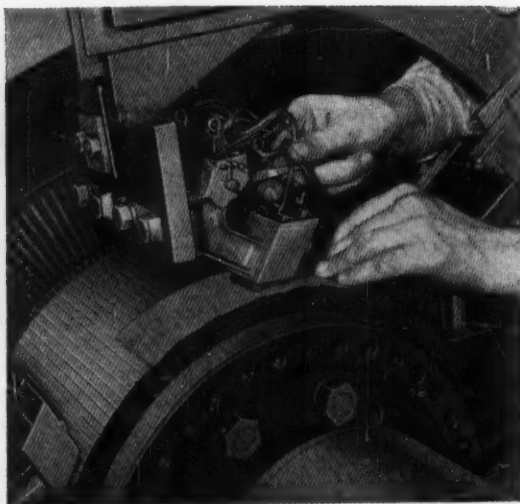
As has already been pointed out selective action has a cumulative tendency and if new brushes do not start out with uniform fits a selective condition can be started which will gradually build up to troublesome proportions.

Atmospheric Conditions—Bad atmospheric conditions can cause an undesirable film on the commutator surface. This film is usually high in resistance and to permit passage of current it must break down. After the film breaks down there is a variation in contact drops, which naturally leads to selective action. Unless a brush is used with sufficient cleaning action to prevent the buildup of the film, or a brush is used whose film-forming influence may develop a satisfactory film of copper oxide before the obnoxious film can be established, selective action will result.

Brush Shunts—The electrical paths from the brushes through the shunts to the terminals and through the terminals to the bus bars must be symmetrical to insure that each brush and each brush arm takes its share of the load. The potential drop across all joints in parallel must be uniform. All terminal connections and bolted joints must be pulled up solid. If a machine is to be painted, all surfaces where electrical joints are to be made must be protected to prevent them from being insulated.

Brush shunts are universally made of stranded copper wires, each wire being approximately 0.005 in in diameter. The size and number of shunts is determined by the maximum total current each brush will be expected to carry. This type of wire gives maximum flexibility without exerting any appreciable pressure on the brush. However, copper will fatigue and if a shunt is located in an air stream where it will get excessive vibration, or if it is unduly vibrated mechanically, the small wires will break and the shunts will

Maintenance Ideas



fray. The resistance of frayed shunts is high, symmetry is disturbed and selective action results.

Shunt Connection — The connection of the shunt to the brush is accomplished either by riveting or by tamping. Both techniques have been improved to the point where they rarely are the cause of failure. However, if the connections do fail, especially if they fail electrically without visible failures of the material, the resulting unbalance always results in selective action and it is quite difficult to locate. It would be false economy to recommend a maintenance procedure other than a visual check of shunt connections. But if selective action is a problem and the underlying cause is not immediately apparent the drop across the shunt connections should be checked for uniformity.

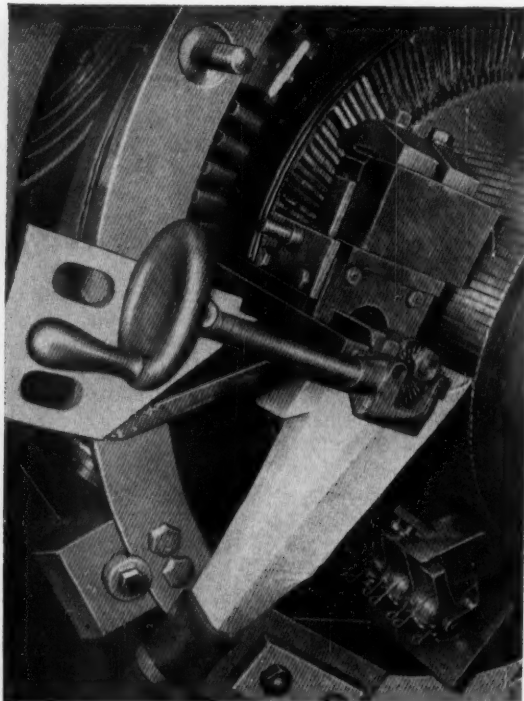
There are other causes of selective action too numerous to mention that tax the ingenuity of the maintenance man. But the underlying problem is always the same—lack of symmetry. Find where conditions are not uniform and you have found the cause of your problem.

Seating Carbon Brushes

The preparation of brushes for general use is sometimes taken too lightly. Proper care must be exercised to see that all brush faces are fitted to and riding the commutator properly. This factor, although minor, can be very damaging if it is not done correctly.

METHOD of seating brushes on DC generators.

GRINDING DEVICE for truing commutator.



"Sand-In" Brushes—Irrespective of the design of the machine or holder, the brushes should be seated or "sanded in". One major exception to this rule is railway traction motors which are radial and are applied in an as-received condition. There also is a condition where a complete set of brushes are not placed on a machine but spotted in one at a time.

If the machine on which the brushes are to be placed has not been overhauled, the commutator should be checked for such defects as burned bars, flat spots, slot build-up and high mica. Should any of these exist, the commutator should be put into condition prior to sanding the brushes. In many instances it will only be necessary to remove the commutator film, which can be accomplished by the use of a rubber-bonded or flex-abrasive stone. Hand stoning is sometimes used but is not recommended unless the maintenance man is highly proficient in the art. Otherwise it can be more damaging than corrective. If flat spots or high bars are present it is best to use a jig stoning device or turn the commutator in a lathe.

You Need These Tools—For brush seating the implements necessary are

very few, consisting of coarse and fine sandpaper and, in some instances, a seating stone. These implements are very common items but it depends upon how they are used as to the end results. There is only one precaution regarding the type of implement used. Never use emery paper to sand the brushes. Emery is an excellent abrasive but it is also conductive and can become lodged between commutator bars causing short-circuiting. Emery also has a tendency to become embedded in the brush faces which may result in increased threading. An excellent sandpaper is Alundum cloth, with aluminum oxide as the abrasive.

What Grade Sandpaper?—The grit of Alundum cloth depends largely upon the brush grades which are to be sanded in. A soft grade, such as carbon graphite, would not require as heavy a grit as a metal graphite or an electrographitic grade. A good all-around grit paper would be around 120 to 150 grit. Some maintenance departments use heavier grit paper, such as, 80-100 grit, but it may be too stiff for general use. If a heavy grit is used it is advisable to make the last couple of sanding strokes with a fine paper.

How to Sand-In—If a standard

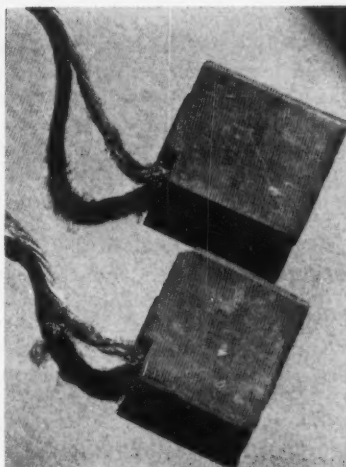
8½x11-in paper is used, cut lengthwise strips equal to the brush width, plus ¼ in to fully cover the brush face. If rolls of paper are used cut to desired length (various-width rolls can be purchased). With the abrasive side toward the brush, slip the paper between the commutator and brush. Pull the paper back and forth until the brush nearly conforms to the commutator and then pull the paper only in the direction of rotation. Make enough passes with the paper so that the brush and the commutator contour match.

To speed up the sanding one can add additional pressure either by increasing the spring pressure or by putting light pressure on the brush by hand. If additional pressure is used have the brush at normal pressure before the final two or three passes.

The main precaution that should be taken is to make sure that the paper is held firmly against the commutator. If the paper is not held firmly brush corners become rounded, decreasing the riding surface area.

Use of a Seating Stone—A brush-seating stone is also used to seat in brushes. Seating stones are made of a very gentle abrasive which wears away rapidly, giving the necessary scouring effect, but not wearing or scratching the commutator or ring. It is available in soft, medium and hard grades. The preferred grade is soft. Some prefer the seating stone to sandpaper because it is easier to apply and the brushes are seated while the machine is running. The seating stone is held on the leading side of the brush and gradually fed onto the commutator. The stone wears down rapidly with the particles passing between the commutator and brush, cutting the brush faces so that it conforms to the contour of the commutator. The most undesirable characteristics of using a stone is the dust which collects around the holders and risers of the commutator. A seating stone seems to be more adaptable to the smaller machines and brushes.

Other Methods—There are other methods of seating brushes than on the machine. If there are a number of machines with the same commutator diameter, a sanding drum can be improvised for the purpose of forming the proper brush face contour. Attach sandpaper to the proper



FRAYED SHUNTS reduce current-carrying capacity.

size drum, mount brushholder in the same position as on the machine, drive the drum, insert brush in the holder and hold it firmly against drum until the proper contour is obtained. Brush seating obtained in this manner is not as accurate as when sanded on the machine because of the variation that exists in holder mounting. The final seating should always be done on the machine.

Upon completion of the commutator or ring conditioning and sanding of the brushes, clean the machine thoroughly. Wipe the excess dust from the brushes with a clean dry cloth. Vacuum or blow out—with clean, dry air—the dust from around the commutator, risers and windings. If compressed air is used make sure that it is free of all moisture and oil vapor. Considerable harm can result from moisture-laden air that is usually present in compressed air systems. Place the brushes in the holders, attach the shunt terminal and the unit is ready to be started.

Properly seated brushes can not alone insure good commutation but it is an additional plus value that can help attain good commutation.

Commutator Films

Good commutation depends to a large degree on establishing and maintaining an optimum contact resistance between the brush and the commutator. It must be high enough to limit short-circuit currents but not so high that excessive electrical losses will result at the brush contact. Since

commutation is adversely affected by a lack of intimacy of contact between the brush and the commutator, another important characteristic of commutator films is that friction must be low to provide smooth riding of the brush. With good commutation and low friction both electrical and mechanical brush wear is kept at a minimum.

What Are Commutator Films Made Of?—It is unfortunate that commutator films are so difficult to specify. This difficulty is due to the fact that their chemical and physical natures depend on many variable factors. Chemical analyses of films which have been carefully prepared under laboratory controlled conditions in noncontaminated atmospheres have shown that the film consists, essentially, of a thin layer of copper oxide over which is deposited a thin layer of carbon from the brush. In actual service, the films may contain at least traces of many components. These may come from "treatments" or "additives" intentionally placed in brushes to provide special properties or from contamination in the ventilating air in the form of dusts, corrosive gases or organic vapors.

The nature of the film which is formed is further complicated by the fact that it is always changing. Two forces are continually at work, one building the film, the other removing it. Current flow through actual areas of contact and mechanical abrasion by brushes are forces which tend to remove film at an imperceptible rate under normal operating conditions. Ideally, this lost film is replaced through oxidation of exposed copper by the atmosphere along with the physical transfer of carbon from the brush.

Commutator color has been used as one criterion in evaluating films. Although uniformity of color is highly desirable, if one examines a stationary commutator surface critically, the slightly different shading in color due to the dynamic nature of filming is evident even on very good films. "Chocolate"-colored commutators have been popular for many years but it is unwise to place too much importance on color since many machines are showing very good performance with films ranging in color from light bronze to almost black. This wider range of commutator colors is at least partially due to the

Maintenance Ideas

expanding application of DC machines over wider ranges of load conditions, speeds, temperatures and atmospheres, along with the presence of special ingredients which have been added to many modern brushes to provide satisfactory performance under these conditions.

Contaminated Films—It has been inferred that obtaining the optimum commutator surface film condition requires a delicate balance between operating conditions, machine characteristics, type of brush material and atmospheric conditions. The latter is particularly important since small, difficult-to-detect changes in the atmosphere may have major effects on the commutator film. The preferred atmosphere for DC machines is fresh, pure, clean air with a humidity content on the order of two grains of water per cubic foot. Generally, these conditions are not completely met in actual installations.

Abrasive materials in the atmosphere, which may come from nearby construction work, dusty plant operations or soil dust carried in the ventilating air, are severe enemies of good commutation and brush life. Gritty particles become embedded in the brush face and score the commutator surface, removing film and instituting threading.

Some of this dirt may collect on the sides of the brush, causing sluggish movement or sticking in its holder and resulting in poor contact and sparking on the commutator. In applications where dusty conditions are recognized as a consistent part of the atmosphere, measures should be taken to filter out the dust or to install totally enclosed machines. Where the dusty condition is only temporary, more frequent cleaning of the commutator and brushes should be done to prevent major

damage to the commutator surface.

Carbonaceous fumes and vapors, which might come from excessive amounts of lubricating oil or tarry fumes from chemicals, such as, coking ovens, may be a source of trouble if present in abnormally high concentrations. The early symptom of trouble with contaminations of this type is the development of a thick dark film which may have a high polish. The film resembles carbonized varnish in many respects. The hard high-resistance high-friction film results in poor commutation. In advanced stages the thick film may peel off in spots leaving a rough commutator surface followed by more serious damage. Excessive oil can usually be avoided by careful maintenance. When excessive smoke and fume contamination cannot be avoided installation of an air filtering system may be profitable for large machines.

Corrosive chemicals are extremely troublesome when present in the atmosphere around DC machines. Chemicals which attack the normal copper-oxide film, such as, ammonia, chlorine and various acids, result in stripping of the film, threading and copper picking. Poor commutation and rapid brush wear result. Other chemical contaminants tend to produce heavy undesirable films by reacting with the copper. One of the best examples, and most troublesome, of this type is hydrogen sulfide. Signs of its presence usually show up in the typically gray-colored copper-sulfide films formed on all copper surfaces in the vicinity.

Atmospheres containing only a few parts per million of hydrogen sulfide may completely alter the nature of the film on the commutator. This is due to the extremely high affinity this gas has for copper. Copper

sulfide replaces copper oxide in the commutator film, resulting in a porous, poorly-bonded film which continues to become thicker as more hydrogen sulfide diffuses through the surface layer to attack the underlying copper. The commutator surface takes on a burned appearance as commutation gradually becomes poorer. Threading and grooving of the commutator, selective action and high brush wear result from extended exposure to this gaseous contamination.

Maintaining the Film Balance—It was mentioned previously that to develop a desirable commutator film the balance between filming and defilming effects must be maintained. Under normal atmospheric conditions and with normal electrical loading, this is relatively easy with modern electrographitic brushes. Nevertheless, there are many operating conditions for which it has been found necessary to provide specially developed brushes with properties ranging from heavily filming to relatively abrasive.

Humidity is an essential component in assisting in the formation of desirable commutator films. Where humidity is too low, as it may be in many cold, dry earth's-surface locations, special chemical filming agents have been added to brushes to substitute for the lack of atmospheric moisture. For applications involving long periods of light-load running, special brushes containing small amounts of organic lubricants may be applied to reduce the natural light scouring or defilming action, thus permitting desirable films to develop.

The defilming nature of brushes is sometimes increased through the incorporation of small amounts of fine abrasive materials in their structure. This type of brush is particularly useful when machines are required to operate in contaminated atmospheres. The mild cleaning action provided by these materials prevents the buildup of the thick detrimental commutator films which would otherwise form. In some cases it may be desirable to apply only a few "cleaner" brushes distributed uniformly around the commutator among the regular brushes. In other instances the best performance may be obtained by fitting the machine completely with brushes possessing mildly polishing characteristics.

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FLANGED LIP SCREENS • FLIGHTS • SHAKER AND CONVEYOR TROUGHS

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1. PRECISION-TAPERED PLUG

Expertly engineered for proper shell expansion. Angle of taper is at the precise degree required for strength, dependability, and quick efficient tightening. Whether in relatively soft formations or other types of rock strata, improved Republic Mine Roof Bolts assure best performance.

2. HIGH-STRENGTH, ALL-PURPOSE EXPANSION SHELL

New, improved Republic RS-1 Expansion Shell is designed for effective use in any type of strata. Wide, strong leaves and flaring inside taper mean extra holding power in relatively soft formations. Narrow base supports for the leaves assure easy expansion and a wedged-like grip as the anchor is tightened.

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Square nut gives over 40% better support than even the best previous method, yet maintains correct bolt tension by stripping at approximately 50 pounds torque with no damage to bolt threads. Nut can be easily applied either side up—another plus feature.

4. IMPROVED SELF-CENTERING HEAD

Compact, one-piece head eliminates need for separate washer. The heavy flange and thick, reinforced washer are guided cleanly and firmly into position in the bolt plate. Entire unit is forged, for ruggedness and strength. Standard 1 1/4" head available with 3/4" and 5/8" bolt sizes.

5. MATERIAL CONTROL CERTIFICATE

Included with every shipment of Republic Roof Bolts is a certificate stating specific physical properties of the steel used. Data provided: yield point in pounds per square inch, yield and break point in pounds, and steel heat number. No guesswork about the quality you get from Republic.

MINE ROOF BOLT MATERIAL CONTROL CERTIFICATE			
<i>Republic Steel Corporation hereby certifies that the mine roof bolts included in mill order number _____ were made from the following steel:</i>			
HEAT NO.	YIELD POINT (PSI)	YIELD POINT (POUNDS)	BREAK POINT (POUNDS)
<i>The above figures are correct as contained in the official records of the Corporation.</i>			
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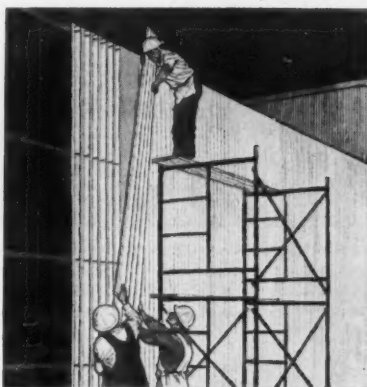
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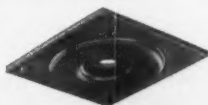
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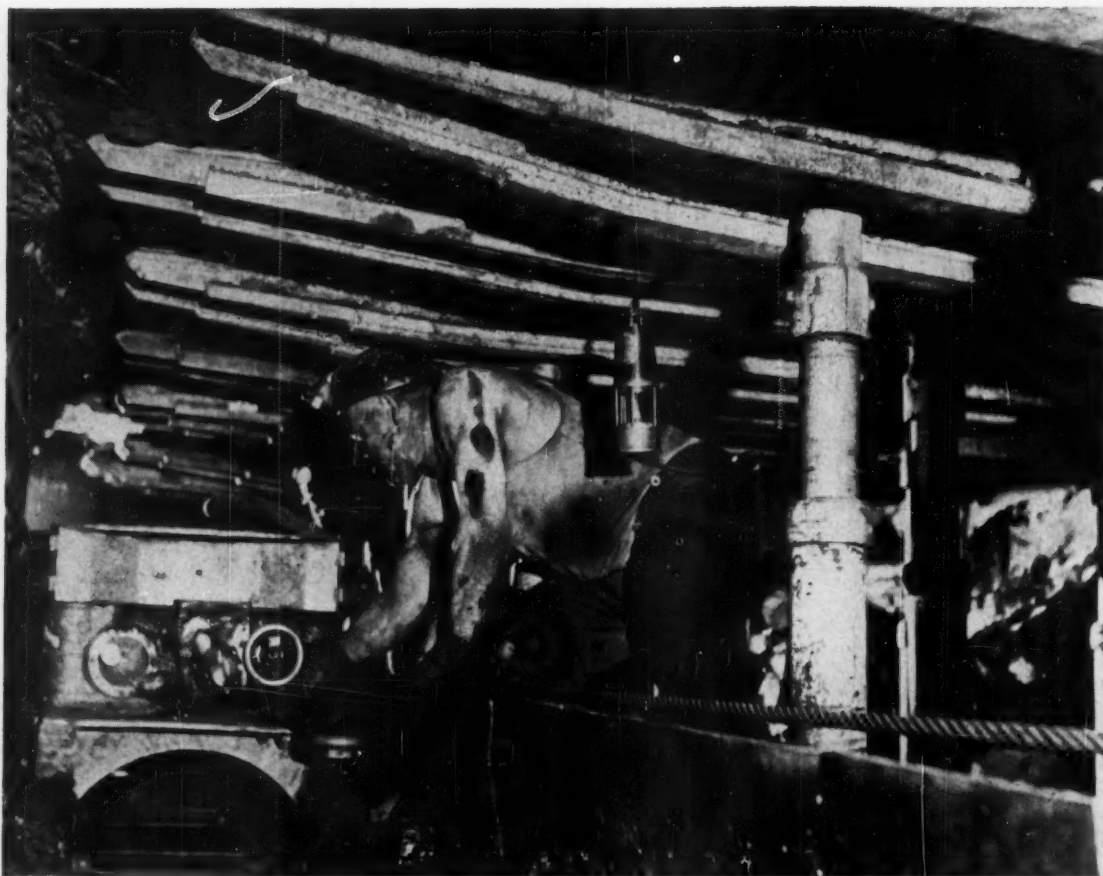
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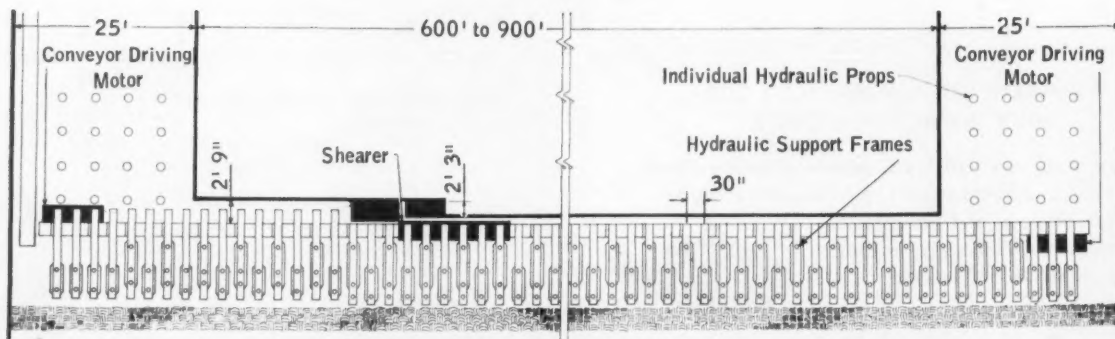


A SHEARER-TYPE MINING MACHINE mounted on the chain conveyor during cutting operations in a British mine equipped with the new "push button" hydraulic roof-support system. The operator is starting the machine for its 27-in cut down the 650-ft face. The support units are ready to be moved forward as the coal is loaded. The support frames are positioned at 2 ft 6 in centers. The cycle will be completed in about an hour, having produced 210 tons of coal from the 4 ft seam.

Hydraulic Roof Support

A British development for longwall mining . . .

Its possible applications in America



FACE LAYOUT during shearing and loading operation.

E. H. Jefferies

Mining Engineer, Dowty Mining Equipment, Ltd., Ashchurch, Glous., England

THE COAL MINING INDUSTRY in England is beginning to realize substantial gain as the result of increasing application of power operated roof support frames in longwall coal operations.

One of the most difficult problems in longwall mining (and the one which in the past, has virtually prohibited longwall application in the U. S.) has been the high cost of labor required to set, take out and move forward the numerous props and crossbars needed to control the roof behind the longwall face.

The initial application of hydraulics in roof support in English mining came in 1946 with the introduction of a hand-pumped hydraulic roof jack to replace rigid steel and wood props. These quick-setting, high load jacks permitted longwall mechanization to proceed with fast loading machines, and with quick support of newly exposed roof.

More than two million of these individual hydraulic jacks, manufactured by Dowty Mining Equipment, Ltd., have been applied in mines throughout the world. While their use has been heaviest in Great Britain, some have been applied in France, Japan, South Africa, Germany, Canada and the U. S.

Mechanized longwall coal mining machines often move as far as 3,000 feet in a shift, and the effort has been recently to reduce the large crews required to set supports fast enough to keep up to the mining machine.

To overcome the expense of the large roof support crew, one English firm has developed a coordinated, self-advancing system of hydraulic support frames extending the entire length of the face, which can be rapidly advanced and set to support new roof.

About 25 of these systems have been built and installed in the United Kingdom in the last two years, and they are now being installed at the rate of one face per week. The development has been so rapid that it is estimated that by the end of 1960, 5% of total British coal production will be accounted for by longwall faces equipped with the new "push button" roof control systems.

On the average, British longwall mines have employed 14 men per face on the roof control function on a 600-700-ft face. Push button hydraulic roof control has reduced this force to two men on every face where it has been applied. (There are usually 18 men required at the face in non-roof support functions.)

Engineers associated with the development of hydraulics in mining in England predict that the rate of a face per week in the application of the new mechanized support system will continue until the saturation point has been reached.

It is significant to note that there has never been a fatal roof fall accident on a face equipped with this British hydraulic roof support system.

Description of British Mechanized Longwall

Mechanized longwall faces in Great Britain vary from 700 ft to 900 ft long, and advance up to 100 in per shift. The mines are planned to provide long face life whenever possible so that a set of longwall face equipment can remain in one section of the mine for long periods without being dismantled. The equipment on a longwall face may work that face for two to three years and extract a block of coal 900x10,000 ft.

The coal is commonly mined by a shearer-type machine cutting a strip between 20 and 27 in wide. The coal is loaded sideways onto a heavy duty chain conveyor which dumps on an entry belt at the end of the face.

As the coal is loaded, steel roof bars are set to support the newly exposed roof.

The two most important factors in successful longwall working are (1) early support and (2) even loading.

Early Support — When longwall faces are advancing at a uniform rate, taking off regular strips, the small amount of roof bending that takes place usually causes breaks to be formed in the roof in front of the face; the distance between the breaks usually being the same as the thickness of the strip. It is important that the roof must be given early support to minimize any bending that may occur when the coal is cut out. If the roof is left unsupported, it may bend and enlarge the preformed breaks until falls of roof occur.

Even Loading—The roof on a caved longwall face is largely held by the supports set under it. The supported roof may measure as much as 12x1,000 ft, the front going over solid coal and the rear edge being the caving break-off line. If the roof is supported more strongly in some places than others, there is a tendency for fractures to be caused at right angles to the face. Power-set props, all set from the same pump, ensure that roof loading is even and the roof is held uniformly together. To control any roof lowering that occurs, it is essential that all props yield at the same pressure.

In the new English push-button hydraulic support system, all of the advantages of the handset hydraulic props are embodied, and much of the effort required to move forward, set and withdraw support units is eliminated. All props and roof-bars are combined in self-contained frames attached to the face conveyor.

Many British installations of the new roof control system are located in seams which could not be economically worked with other methods. One face in the Blackshale seam had a fault which at times had a vertical displacement of five feet advance slowly across the 700 ft face. When the new hydraulic support system was made operative, the face was steadily advanced with no loss of output.

An early installation in the Waterloo seam in England produced a cost per ton reduction of 36% and an increase in output of 30%. Five installations have now been made at one mine near Nottingham. Production there averages 25,000 tons per week in seam heights of from 33 to 46 in. Best results so far at this mine have been obtained with a face length of 850 ft.

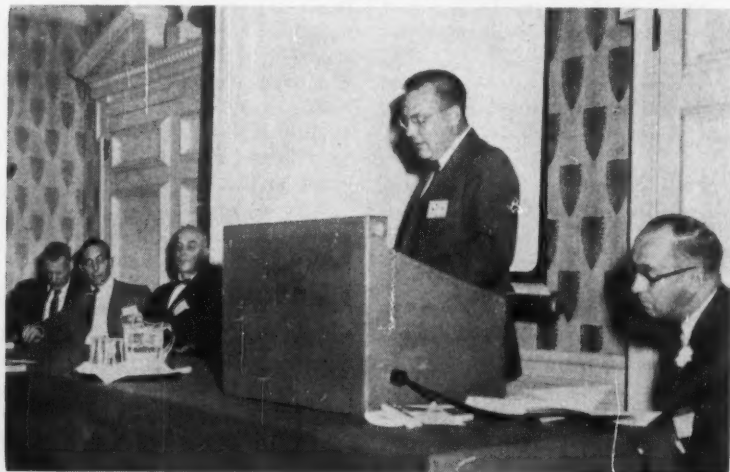
It is suggested by the British engineers responsible for the development of the new hydraulic system that its potential U. S. application is enhanced by rapid development techniques in America. Mechanized longwall faces can be retreated from predetermined boundaries, they say, eliminating the unproductive man power which would otherwise be essential in advancing longwall systems. The result, claim the British, would be large tonnages produced with high productivity rates.



SAFETY IN OPERATIONS—C. William Parisi (left), Pittsburgh Coal Co.; W. C. Kegel, Jones & Laughlin; M. E. Fowler, Duquesne Light Co., and L. H. Johnson, USBM, session chairman.



SAFETY IN ROOF CONTROL—C. E. Mongan Jr. (left), and Thomas C. Miller, USBM; William W. Hines Jr., U. S. Steel Corp.; C. H. Hoch, National Safety Council, and J. W. Pero, Pocahontas Fuel Co.



SAFER MINING ENVIRONMENT—John Nagy (left) and Donald W. Mitchell, USBM; T. K. Sutherland, Clinchfield Coal Corp.; G. L. Alston, Min. Safety Appliances Co., and Martin F. Brennan, UMWA, session chairman.

New Avenues To Safety

Industry representatives at National Safety Congress discuss ways to improve safety in mining operations and research programs now in progress aimed at solving problems such as dust control and roof exploration.

NEW IDEAS for improving safety in haulage, roof support, ventilation and equipment applications and maintenance were featured by speakers at the technical sessions of the Coal Mining Section of the National Safety Congress at Chicago, Ill., Oct. 17-19. Also garnering high interest were discussions of bulk-handling of rock dust to reduce overall costs of its application and the results of research on float dust and its control.

Delegates to the meetings of the section elected officers for the coming year as follows:

Chairman—J. D. Reilly, vice president, Hanna Coal Co., Div. of Consolidation Coal Co., Cadiz, Ohio.

First vice chairman—Martin F. Brennan, president, District 7, United Mine Workers of America, Hazleton, Pa.

Second vice chairman—Marling J. Ankeny, director, U. S. Bureau of Mines, Washington, D. C.

Secretary-treasurer — H. F. Weaver, chief, Branch of Coal Mine Inspection, USBM, Washington.

Mr. Reilly succeeds Joshua Smith, director of safety, Eastern Gas & Fuel Associates, Mt. Hope, W. Va., in the office of general chairman.

Abstracts of the proceedings are as follows:

Practical Experience With Fire-Resistant Hydraulic Fluids, by J. A. Younkins, assistant general superintendent, Coal Dept., and M. E. Fowler, safety director, Harwick mine, Duquesne Light Co., Pittsburgh, Pa. (Presented by Mr. Fowler.)

The full text of this paper by Messrs. Younkins and Fowler appears in the October, 1960, issue of *Coal Age*, beginning on p 96.

A Good Maintenance Program for Safety as Well as Production, by W. G. Kegel, general master mechanic, Vesta-Shannopin Coal Div., Jones & Laughlin Steel Corp., California, Pa.

"Generally speaking, overall maintenance accounts for about 20% of production costs, and an endeavor of this magnitude certainly demands its share of consideration and supervision."

Surface installations at the Vesta-Shannopin properties include all power-conversion units, a large central shop, supply yards, and one of the larger preparation plants in the industry. The equipment included in this list easily matches, in number and complexity, that found in most any other branch of heavy industry. Conversion machinery presents the hazards of the electrical industry. Maintenance work on high structures, including in the preparation plant and in shafts, makes it mandatory that special safety precautions be taken. The central shop presents the safety problems encountered in the heavy manufacturing industry.

Maintenance at the face is accomplished under the most adverse conditions. Manufacturers of face machines could give more attention to the design of such equipment for facility of maintenance. Recent developments have produced larger and more powerful machines with heavier component parts. However, the design of some of these parts does not give consideration to efficient and safe handling when making repairs. The handling of heavy parts inside the mine is a first-class hazard. J&L closely restricts the types of work that will be performed on the section. Any machine that fails beyond the point where components can be safely handled is sent to the central shop.

Another safety problem presents itself in checking broken controllers of face machines. J&L requires that the nips be removed and that checking be done with the aid of battery-powered ohmmeters which are supplied by the company. Manufacturers might consider the feasibility of equipping complicated controllers with a test or sequencing panel for fast, safe testing.

Safe Handling of Trips on Grades, Utilizing Battery-Operated Brake Cars, by C. William Parisi, director of safety, Pittsburgh Coal Co., Div. of Consolidation Coal Co., Library, Pa.

A change in mine cars, from 6-ton, 4-wheel units to 12-ton, 8-wheel cars, made it necessary to study ways and means of providing safe braking action in hauling trips of loaded cars. The use of drags, derails and trailing locomotives were ruled out, primarily because of the damage and hazards that result from these methods in the event of a runaway trip.

The solution at the subject mine was

to employ specially-designed brake cars equipped with magnetic shoes which grip the rail and introduce the necessary friction to stop a runaway trip. The brake car is of 8-wheel construction and weighs approximately 7 tons. It is equipped with four 12-V batteries, six magnetic brake shoes each 42 in in length, two governors, two centrifugal switches and head and tail lamps. The head and tail lamps, when glowing, indicate to the haulage crew that the car is functioning properly and is set for automatic operation.

Numerous tests were conducted to satisfy everyone of the ability of the cars to stop runaway trips. Tests on wet and dry rails showed that the cars were effective to an equal degree under both conditions.

Four brake cars and an extra set of batteries are maintained at the mine. Use of the extra set of batteries permits a change of batteries in about 15 min, and each set is charged once each week, a process requiring 5-6 hr. Normal charge in a set of batteries will hold a trip on a grade continuously for 90 min.

The cars are used primarily to prevent runaways on upgrade hauls, but they can be employed as retarders on downgrade hauls. In the latter application, the locomotive operator is provided with a pushbutton station in his cab to energize the brakes as required.

Safe Mining Under Difficult Roof Conditions, by J. W. Pero, assistant to the president, Pocahontas Fuel Co., Div. of Consolidation Coal Co., Pocahontas, Va.

In a lantern slide presentation the author outlined several mining plans for development and pillaring in the Pocahontas Nos. 3 and 4 seams, including the widespread use of wing-and-pocket systems for final recovery. Throughout the field roof bolts have had immediate and wide acceptance, although in some instances a single post is used at the open end under a bolted crossbar to give an indication of weight.

Progress Report—1960 National Campaign to Prevent Injuries from Falls of Roof in Coal Mines, by C. H. Hoch, staff representative, Coal Mining Section, National Safety Council, Chicago, Ill.

A 26% reduction in the frequency rate of injuries caused by falls of roof, face or rib has been achieved during the first 6 mo of the current roof-fall campaign. These results reflect the efforts of the participating mines who submitted their base reports covering one of the three years prior to the campaign, and to Jan. 30 of this year. This frequency also their injury experience from Jan. 1 rate reduction represents the difference

between the totals of these two sets of reports.

Two hundred twenty-three fewer injuries occurred in these mines during the first 6 mo of this year than occurred during the comparable length of time in the base reports. Of these 223 prevented injuries 21 would have been fatal.

These savings justify all the expense, time and effort that have been put forth in this venture. The results point up the need for greater effort by everyone concerned.

Much work remains to be done. We should all be dissatisfied with the fact that over 900 mines were persuaded to enroll, then for some reason were allowed to lose the interest necessary to actively participate in the campaign—and to submit the necessary reports when they are due.

Reports from the Bureau of Mines and the state mining departments show that we have an unfavorable trend in injuries for this year. This should remind us that accelerated effort is needed.

Safety Advantages of Using Yielding Jacks in Lieu of Cribbs in Pillar Mining, by William W. Hines Jr., mine inspector, Frick Dist., United States Steel Corp., Uniontown, Pa.

The attributes of an ideal roof-supporting device for the fast pace of modern continuous mining are (1) mobility—for quick support of exposed roof areas; (2) great strength—to support the weight of the wide roof areas; (3) a means of warning—to show when the place starts to take weight; and (4) a quick and exposure-free means of removal of the support—when such support is no longer required.

Somewhere along the historical line between the use of single posts and the introduction of crossbars to support the roof, a device with great strength was needed to support the wider expanses of roof brought about by the open-end system of mining, and the crib was introduced.

To a degree the crib offers two of the four attributes of an ideal roof support in an open-end place. It has great strength and it will provide warning of weight. However, too much exposure time is involved in building and recovering a crib.

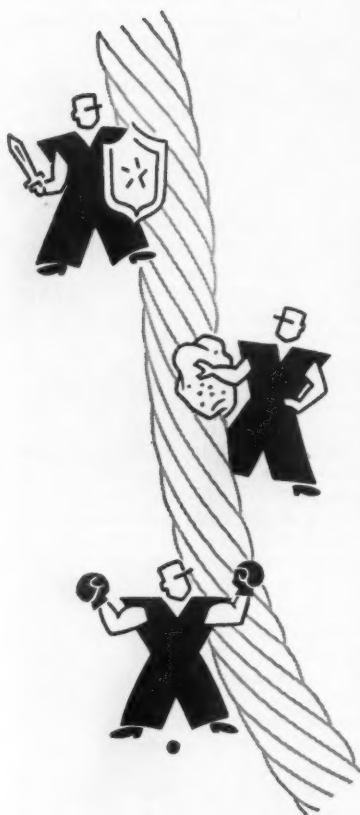
In endeavoring to eliminate the use of cribbs a decision was made to try the yielding-type jack, either hydraulically or mechanically operated. These supports exhibit the four attributes of the ideal roof support.

Favorable accident experience has resulted in the Frick District, and the loss of yielding jacks under falls has been very low. They are highly mobile; they have great strength; they provide audible warning when taking weight, and they can be recovered from a safe distance. (Continued on p 119)

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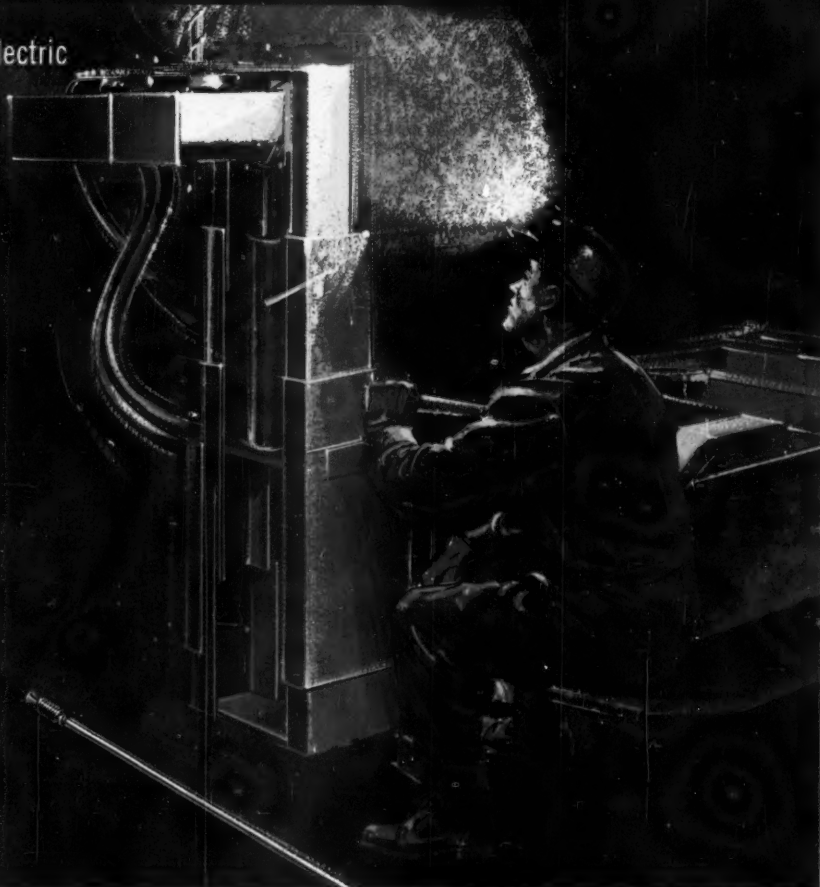
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NSC (continued)

Exploration of Coal Mine Strata by Sonic Techniques, by Charles E. Morgan Jr., consulting physicist, and Thomas C. Miller, mining health and safety engineer, U. S. Bureau of Mines, Pittsburgh, Pa. (Presented by Mr. Miller.)

Theory and experiments in the laboratory and in the field indicate the practicability of exploring roof strata using sonic techniques and equipment. This is a system of generating a sonic or ultrasonic beam, shaping the beam and introducing it onto the strata to be studied. Return waves from the strata are picked up by a receiver with the aim of establishing the nature of the material traversed by the sound waves. Presence and locations of interfaces and obstacles in the strata can be fixed.

Tests at Bruceton confirm the usefulness of the method. Now being studied are designs for lighter, more compact equipment for underground use. No great difficulties have been encountered in using the equipment in a mining environment. In actual tests the equipment has accurately fixed the nature of roof strata to a depth of 57 in.

Ventilation of Gassy Mines in Coal Beds From 12 to 20 Ft Thick, by T. K. Sutherland, safety director, Clinchfield Coal Corp., Dante, Va.

The coal being mined at Moss No. 3 mine consists of a hard upper bench and a soft lower bench separated by a layer of rash. The ribs slough to a serious degree because of the nature of the seam and the presence of slips in the upper bench. Under these conditions the use of brattice cloth created a safety problem, in that equipment operators could not see the rib to watch for impending sloughing. Furthermore, air losses through the brattice were excessive.

The solution to the problem was found in replacing brattice cloth with ventilation tubing in producing sections. The system includes a blower fan driven by a 25-hp motor, a section of 30-in tubing which serves as a main and laterals of 18-in tubing which carries air from this main into the headings in a developing section. All tubing is suspended from the roof on wires which are installed during the roof-bolting operation. As much as 5,000 cfm can be delivered to the faces in the five headings.

In order to prevent recirculation of air, permanent stoppings are built up to the loading point and fly curtains are used from loading point to face. The loading point is advanced at 160-ft intervals, and the tubing-and-fan system is moved up at the same time. The system has worked satisfactorily at Moss No. 3.

Rockdusting in Multiple-Shift Mine Operations, by G. L. Alston, product

line manager, Mine Safety Appliances Co., Pittsburgh, Pa.

Hopper capacity in underground rock-dust distributors has been limited heretofore because hoppers had to be made with 60-deg slopes at the sides to make the dust flow toward the discharge. Fluidizing the dust with air permits the use of 6-deg slopes, thereby providing a substantial increase in hopper capacity.

By taking advantage of the "Airslide" principle it is now possible to build distributors of 48-in overall height that will hold 20,000 lb of dust. Face distributors now are on the market with capacities of 4,000 lb.

A recent development is a bulk car with a 12-ton capacity which is used to transport rock dust in bulk from the surface to the working sections, where it is transferred to the Airslide distributor. The next step will be to transport the dust in bulk from the quarry to a ground level bin at the mine, thence through a borehole to the mine level.

For a full discussion of handling rock dust in bulk, see the article entitled "Better Rock Dusting Cheaper," beginning on p 104 in the August, 1960, issue of *Coal Age*.

Research on Float Dust Hazards, by John Nagy, chief, Branch of Dust Explosions, and Donald W. Mitchell, chief, Mine Experiments Section, U. S. Bureau of Mines, Bruceton, Pa.

Conclusions of current tests in the Bureau's experimental mine indicate that float-coal dust deposits present an explosion hazard if preventive measures are not taken. The hazard can be neutralized by generalized rock dusting. Current research indicates that an incombustible content of 80% is required. The increase in incombustible from the minimum 65% specified in the Federal Mine Safety Code to 80% is due primarily to the fineness of the float coal. The 80% incombustible in mine dust in return airways where float coal is deposited must be maintained in the rib and roof dust as well as in the floor dust. Previous research has shown that heavy "blanket" rock dust deposits on the floor, with even as much as 95% incombustible, do not compensate for a deficiency in incombustible in rib-roof dust.

Research is being conducted on methods for trapping the airborne dust. One obvious solution is to prevent dissemination of the dust from the face; however, present methods are not adequate or they interfere with face operations. Consideration is being given to the use of foam, the continuous dispersion of rock dust, and the binding of the dust to the mine rib and roof surfaces to prevent dispersion in the event of an explosion. Further explosion tests are being conducted to provide more detailed information on the float dust hazard and on stratified layers.

Midwest Mining, Marketing . . .

SURVEYS of operations at three new midwestern mines, factors to be considered in coal preparation, the role of coal in the future energy market and new methods of mining U. S. coal were subjects highlighting the program of the 69th annual meeting of the Illinois Mining Institute at Springfield, Ill., Oct. 21. More than 325 members and guests attended the meetings at the Hotel Abraham Lincoln.

At a business session which opened the day's proceedings officers for the coming year were elected, as follows:

President—**Stuart Colmon**, president, Bell & Zoller Coal Co., Chicago, succeeding **H. C. McCollum**, vice president, Peabody Coal Co., St. Louis, Mo.

Vice President—**R. J. Hepburn**, vice president, United Electric Coal Cos., Chicago.

Secretary-Treasurer—**George M. Wilson**, Illinois State Geological Survey, Urbana, Ill.

Members elected to 3-yr terms on the executive board are **H. E. Mauck**, vice president, Freeman Coal Mining Corp., Chicago; **Eugene T. Moroni**, assistant vice president—operations, Old Ben Coal Corp., Benton, Ill.; **R. H. Swallow**, vice president, Fairview Collieries Corp., Indianapolis, Ind., and **W. A. Weimer**, chief engineer, Peabody Coal Co., St. Louis, Mo.

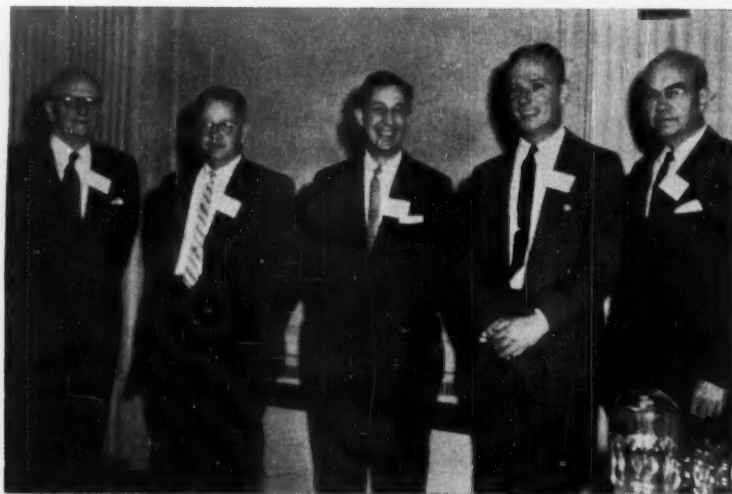
The technical program comprised eight formal papers by authorities in mining, preparation, mineral economics and earthmoving. Resumes of the papers follow:

Old Ben Mine No. 21, Eugene T. Moroni, assistant vice president—operations, Old Ben Coal Corp., Benton, Ill.

Old Ben Mine No. 21 is situated near Sesser, Ill., to recover a tract of Franklin County coal having over 100 million tons of recoverable coal. Ultimate production is to be 15,000 tpd or more, and facilities including shaft and cleaning plant have been designed to handle this level of production.

A reservoir of 105 million gal of water is available on the property, and this can be increased as silt accumulates by raising the height of the spillway. The shaft is equipped for automatic skip hoisting at a rate of 80 10-ton loads per hr.

Underground haulage roads are made of 85-lb rail. Every fourth crosstie is made of steel to preserve the 42-in



OPERATIONS—Nelson L. Davis (left), Nelson L. Davis Co.; Rufus R. Tucker, Ayrshire Collieries Corp.; E. T. Moroni, Old Ben Coal Corp.; Joseph Schonthal, J. Schonthal & Associates, session chairman, and L. O. Millard, Link-Belt Co.

track gage. Crushed stone ballast provides a 4-in minimum depth under the ties to permit high-speed transportation. Intermediate haulage to the track is provided by ropeframe belt conveyors, and face transportation is provided in shuttle cars of 13-ton capacity.

Coal is mined by Goodman Type 405 AC-powered boring machines. These machines drive openings 12 ft 10 in wide by 7 ft high. Advancement is at a rate of 24 in per min for delivery of 6% tmp. This delivery rate is expected to increase during retreat operations.

For a full description of Old Ben No. 21 see the article entitled, "New Coal for Midwest Steel," beginning on p 100 of the July, 1960, issue of *Coal Age*.

The Use of Ratio Feeders in Solving Surges on Belts in Underground Haulage, by Rufus R. Tucker, superintendent, Thunderbird mine, Ayrshire Collieries Corp., Farmersburg, Ind.

Studies showed that the adoption of Ratio-Feeders under the conditions prevailing at Thunderbird would lead to a 15% increase in productivity by reducing the discharge time of the shuttle cars. Similar studies show that productivity can be substantially increased without changing to wider belts. The idea is that belt capacity is more fully utilized, since the discharge rate of the Ratio-Feeder can be adjusted to permit sev-

eral units to discharge to the same belt without overloading the belt.

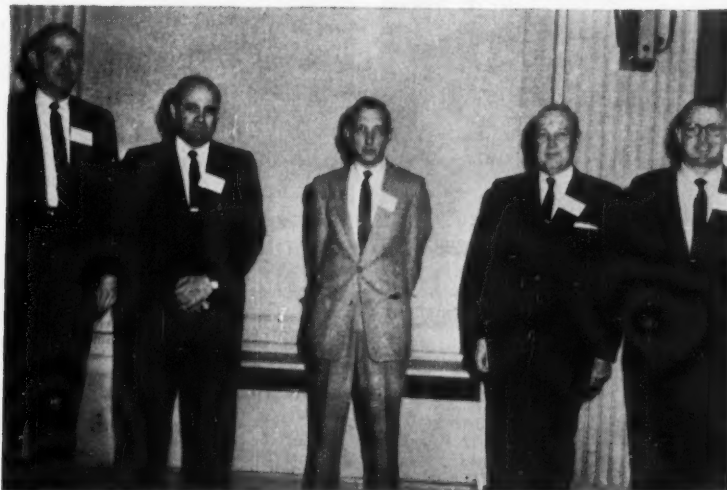
Advantages of the Ratio-Feeder are not limited to increased production alone. Belt alignment problems are reduced significantly. Even loading of the belt eliminates surge loads normally placed on belts by shuttle cars. These surge loads require constant repositioning of belt idlers and many man-hours for belt-line cleanup.

In addition, shuttle-car operators are not required to use their judgment in joggling their load directly onto the belt. This results in less wear on shuttle-car transmissions.

Factors affecting the direct savings that can be achieved with Ratio-Feeders can be segregated and values placed on specific items. The percentage reduction in labor cost closely matches the increase in productivity that may be gained through the use of Ratio-Feeders. Labor costs for belt cleaning may be reduced as much as 80%. Reduced labor and material cost for belt maintenance would be from 2½ to 3c per ton. Savings of about 3c per ton can be realized in the reduced labor and materials costs of providing boom holes and ramps at discharge stations for shuttle cars.

German Brown-Coal Mining With Bucket Wheel Excavators, L. O. Millard,

Themes at 68th Annual Meeting of Illinois Mining Institute



NEW PROJECTS—J. P. Weir (left), Paul Weir Co., session chairman; Hubert E. Risser, Illinois State Geological Survey; E. M. Warner, Joy Mfg. Co.; M. J. Ankeny, U. S. Bureau of Mines, and R. H. Inman, United Electric Coal Cos.

assistant general sales manager, Link-Belt Co., Chicago, Ill.

Motion picture (sound) shows field applications of various wheel excavators, including units rated from 250 cu yd per hr up to 13,000 cu yd per hr. The machines are built by Orenstein-Koppel und Lubecker Maschinenbau AG, a West-German manufacturer represented in the U.S. and Canada by Link-Belt.

Primary and Secondary Cleaning for Uncrushed Illinois Coals With Heavy Media, Nelson L. Davis, president, Nelson L. Davis Co., McHenry, Ill.

The Baum jig was originally developed in Europe to clean coal sizes that were too small for hand-picking, that is, minus 2 in. Soon after its introduction here many concessions were made that later proved to be in error. The principal concession was a relaxing of the top size limit from the original 2 in to 6 in. Crushing of R-O-M to a top size of 6 in and consequent elimination of hand picking provided the impetus for plants of this design. However, the advent of full-seam mining introduced some complications. The turbulence required in the jig to clean the coarse sizes resulted in inadequate cleaning of the minus ¼-in coal, and inadequate reduction in ash resulted in such coarse coal sizes as were laminated with impurities.

Expensive plants to handle these

problems may be justified in the production of metallurgical coal, some simplification is needed in cleaning steam coal. One possible solution in producing steam coal from a deep-mined raw coal is to adopt two-stage heavy media to handle all plus 1¼-in raw coal, uncrushed. The minus 1¼-in is cleaned in a jig. The heavy-media stages operate at 1.70 and 1.35 sp gr, providing a reduced volume of middlings that can be crushed to free good coal from laminated impurities.

The advantages are (1) no R-O-M crusher is required, (2) coarse coal yield is increased, (3) crushing of coarse coal after washing reduces the drying capacity otherwise required and (4) the size of the small-coal cleaning section of the plant is reduced, providing an important reduction in capital costs and operating expense.

Banner Mine—Direct Water Shipment, R. H. Inman, chief mining engineer, United Electric Coal Cos., Chicago, Ill.

Banner mine is located in Peoria and Fulton Counties on the Illinois River. It is the newest of United Electric's properties and features complete waterborne shipment of the product. For a full description of Banner operations, including drainage techniques employed in stripping low-lying bottom lands, turn

to the full length feature beginning on p 70 of this issue of *Coal Age*.

Joy Pushbutton Miner, E. M. Warner, Joy Mfg. Co., St. Louis, Mo.

In a slide-film presentation the author offered a progress report on a pushbutton mining project now under construction in western Kentucky. The spiral ramp which will hold the articulated conveying system is nearing completion, and it is expected that first trials of the system will take place in the near future. See p 26 of the May, 1959, issue of *Coal Age* for an analysis of the idea and the planned method of operation.

Coal in the Future Energy Market, Hubert E. Risser, principal mineral economist, Illinois State Geological Survey, Urbana, Ill.

Experts predict a gas and oil deficit within the next 20 yr. In the face of increasing demand, production gradually will level off as a result of declining availability of these fuels. The deficiency will have to be made up from other sources, including coal, oil shale and tar sands. It appears logical that in many of the uses of gas and oil where coal can perform the required service in its natural state, a reconversion to coal will take place. Where conversion is essential, coal will play a major role.

The electric power industry now is the major user of coal, and this market can be expected to expand. In other uses, where gas and oil have taken over, coal will continue to be in a difficult competitive position. But within the next 15 to 20 yr the situation will be different. The changes will stem from the continuing growth in energy consumption and the impending deficits in other fuels.

Experiments on the Hydraulic Mining of Coal, Marling J. Ankeny, director, U. S. Bureau of Mines, Washington, D. C.

The author presented a motion picture of hydraulic mining of the Pittsburgh seam of coal near Indiana, Pa., where it was shown that the coal could be successfully cut by a high-pressure stream of water. Recent developments include mounting the monitor on a conventional loading machine for greater mobility, and extending the experiments to anthracite. A major producer in the anthracite region and the Bureau have agreed to try the process in the Wilkes-Barre area.



MINING, PURCHASING, SELLING COAL—A. E. Spotte (left), Princess Coal Sales Co., Huntington, W. Va., session chairman; Clyde Storey, Princess Coals, Inc., David, Ky.; C. R. Mabley, Island Creek Coal Sales Co., Huntington, W. Va.; D. M. Given, Union Carbide Corp., New York, N. Y.; and D. H. Davis, Mountaineer Coal Co., Monongah, W. Va.



PERCY NICHOLLS AWARD—C. E. Lesher (left), coal consultant, Pittsburgh, Pa., receives award from R. B. Engdahl, chairman of award committee, at the annual banquet.



COMBUSTION, ANALYSIS, GASIFICATION—H. C. Skaggs Jr. (left), Appalachian Power Co., Charleston, W. Va., session vice chairman; J. B. Walker Jr., Babcock & Wilcox Co., Barberton, Ohio, session chairman; J. F. Mullen, Combustion Engineering Co., Windsor, Conn.; E. J. Sandy, West Virginia University, Morgantown, W. Va.; and C. D. Pears, Southern Research Institute, Birmingham, Ala.



UTILIZATION—M. L. Jones (left), E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., session chairman; R. W. Precious, Union Carbide Corp., Charleston, W. Va., session vice chairman; C. E. Day, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.; M. E. Robinson and W. L. Kurtz, National Coal Association, Washington, D. C.; and C. E. Rodenburg, Rust Engineering Co., Pittsburgh, Pa.

Economics in producing and utilizing coal highlight . . .

Joint Solid Fuels Conference

MORE THAN 200 engineers, executives and guests gathered at the Daniel Boone hotel, Charleston, W. Va., October 24 and 25 for the 23rd annual ASME-AIME Joint Solid Fuels Conference. Major topics included mechanical mining in thin seams, what industrial consumers look for in purchasing coal, the supplier's viewpoint in selling coal and coal utilization. Other subjects included underground gasification, a comparison of methods of analyzing coal for sulphur and the relation of volatile matter in coal to pulverized coal-fired units.

Three technical sessions were supplemented by two luncheons and the annual banquet, with speakers and topics as follows:

Stephen A. Dunn, president, National Coal Association, "The Future of Coal is not Black." While noting that the future of coal is not 100% rosy, Mr. Dunn emphasized that the prospects are better than they have been for some time. Coal research is particularly important and the construction of the new central laboratory near Pittsburgh will be a great aid in improving coal's outlook.

Hon. Cecil H. Underwood, governor,

State of West Virginia, "West Virginia Coal Resources." Two problems facing West Virginia and its coal industry are competition from other fuels and automation. The solution to the problems is new and expanded uses for coal, based on chemical research. Governor Underwood announced that a pilot plant designed to gasify coal through the use of atomic energy has been approved by the federal government and promised to West Virginia. The pilot plant, which is part of project Turret, will be the first reactor to produce process heat with nuclear energy. It is being designed at the AEC laboratory, Los Alamos, N. M.

Ivor F. Boiarsky, "Tour of the Holy Land."

Featured at the annual banquet was the annual presentation, by R. B. Engdahl, of the Percy Nicholls Award to Carl E. Leshner, coal consultant, Pittsburgh, Pa., for outstanding service in the solid fuels field.

D. H. Davis, Mountaineer Coal Co., Monongah, W. Va., was chairman of the Monday morning session and A. E. Spotte, Princess Coal Sales Co., Huntington, W. Va., was vice chairman. Members of the ASME led the other sessions.

Topics and speakers were:

Mechanical Mining in Low Seam (28-36 in) Mines, Clyde Storey, production engineer, Princess Elkhorn Coal Div., Princess Coals Inc., David, Ky.

Princess Coals produces 5,000 tpd in coal averaging 30 in, employing nine conventional units. Some of the problems unique to thin-seam mining are:

1. Delays because of lack of clearance and the effect of equipment on air circulation. Heat dissipation on motors is also a problem.

2. It takes longer to make repairs.

3. Available loading time decreases as coal thickness decreases. As a result new loaders with capacities up to 3 tpm are now available.

4. Supply costs increase with a decrease in seam height. For instance, life of trailing cables is short because they are not hung along the rib. Rockdusting cost is greater and timber costs are higher.

Princess Coals has offset these disadvantages by increasing productivity and is proud of its record, which is better than the national average for all mines. A preventive maintenance program plays an important part in keeping productivity at a high level.

What Industrial Consumers Look For in Purchasing Coal, D. M. Given, Union Carbide Corp., New York, N. Y.

Industrial coal users must find the most economical and efficient method of

putting fuel to use. Fuels represent 1 to 2% of most manufacturing costs but in some instances may be as high as 35%.

The yardsticks for buying coal include specifications, utilization costs and supplier performance. A buyer is concerned first with which coal can be used to generate the desired quantity of steam without interruption or damage to the equipment. Changing conditions sometime require a change in the original specifications for coal.

Having determined the coal tolerance for a plant, the next step is to decide which coal will do the job best. The problem of handling wet or frozen coal can be a major problem and also is costly. Sulphur in coal can cause corrosion problems. Moisture, ash and sulphur content have the most important bearing on incremental cost to the buyer. Careful sizing is important in stoker operation, both in getting uniform burning and easier handling.

The Supplier's Viewpoint in Selling Coal, C. R. Mabley Jr., president, Island Creek Coal Sales Co., Huntington, W. Va.

The viewpoint of the coal supplier is the composite of many factors, each bearing on the present and future problem of meeting the expanding needs of the coal customer.

The coal supplier does not sell a standardized bulk commodity to a faceless, impersonal market. Instead he starts with the basic needs of the customer and the plant and then attempts to provide the exact type and size of coal that will produce the most efficient and economical operation of the plant.

The supplier is also aware that he lives and works in a world of economic realities and that prevailing conditions of supply and demand are predominant in their over-all effect. He knows that his customer expects his loyalty in periods of tight markets. In return he believes that his customer should recognize the problems that arise for him during periods of depressed markets. Benefits will accrue to supplier and customer if there is full and complete recognition and understanding of these factors.

Long-term buying arrangements between the seller and buyer brings advantages something like those that accrue from the dollar averaging of stock purchases. The long-term buyer, wanting first the important advantages that adhere to the regularity and stability of supply, does not throw these values away in attempting to make a killing in the market for, like the part-time stock speculator, the speculator in coal generally loses.

It is probable that long term buying will become streamlined, simplified and much more standardized than it is today. One of the main reasons is that, in the near future, the bulk of coal production will go into the steam market, which will

have a pronounced effect on the entire structure of the coal business.

A Decade of Electric Utility Fuel Experience, Myles E. Robinson, director, Department of Economics and Transportation, and William L. Kurtz, senior economist, Department of Economics and Transportation, National Coal Association, Washington, D. C.

The decade between 1949 and 1958 saw rapid strides in provisions by the utilities to meet our mushrooming population and fast expanding economy. To summarize the national generation picture: Coal remained steady throughout the period, even increasing slightly percentage-wise. Oil's trend was downward, though since 1954 the decline seems to have halted. Natural gas expanded in the whole decade, experiencing most of this growth in the first 5 yr and actually declining in the second 5-yr period.

Since 1956 the increasingly competitive market for utility fuels has caused certain shifts in these trends. For the United States as a whole, coal's per cent is down, while to a large extent due to current penetration of residual oil and natural gas into the total market, the percentages of these two have risen.

In the framework of the statistics developed for this paper the following conclusions can be set forth:

1. Of the three major fuels, based on the heat rate, coal has made the greatest improvement with gas second and oil third.

2. While the 10-yr trends in fuel utilization have established fairly definite relationships between the fuels, a secondary and possibly new trend appears to have started in 1956 and may well alter relationships of the three fuels in the years immediately ahead.

3. Based on improvement in fuel consumption per unit of electric output, coal's greatest gains have been in the East South Central States, oil's greatest growth in the South Atlantic region and gas has made its best showing in the East North Central States.

4. Because of lack of comparative cost data and the increasing intensity of intra-fuel competition for the utility market, projections of either consumption or efficiency would largely be meaningless.

New Concepts—Coal From Mine to Industrial Boilers, C. E. Day Jr., senior service engineer, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

For a coal-fired plant there is no practical way to eliminate a coal-handling system, bunkers, or silos and the ash-handling system, plus fly-ash collection if the latter is required by law. But good engineering can at least keep these investments to a minimum. Manufacturers

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McDowell Fast-Line pipe has many other advantages . . . all proved under working conditions. It's re-usable, too. Comparative light weight permits ceiling or wall mounting.



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have recently recognized the need for low-cost units designed specifically for the small industrial plant and these have significantly reduced prices. The BCI has led the effort in this direction and their field engineers (now a part of NCA) are available for consultation.

The best way to obtain the potential savings by burning coal is to eliminate the investment for coal and ash-handling, and you can do this by renting this equipment.

Several thoughts for development in the future include locating pulverizing equipment at the mine and shipping the pulverized coal to the pulverized-coal-burning plants. This would reduce the power-plant investment by the cost of the pulverizers, effecting a major capital reduction.

A portion of this saving would have to be shared in the form of higher fuel costs to offset higher preparation and shipping costs. At the plant the coal would be unloaded pneumatically from closed cars. Coal storage could be in large cloth or plastic bags. The pneumatic unloading system could also be adapted to larger coal for stoker plants.

Perhaps the most effective use for coal would be that of a very large mine-mouth plant combining chemical separation, power generation and fuel production.

A Concept of Combustion Control for Firing Two Solid Fuels, C. E. Rodenburg, staff consultant, The Rust Engineering Co., Pittsburgh, Pa.

Increases in fuel costs and technical advances in manufacturing processes have caused the management of many industries to consider the combustion of waste materials.

Recently our organization was retained to design and construct a boiler plant as part of an expansion program of a large eastern manufacturer of fine bond paper. Studies showed that about 58% of the total fuel capacity would be produced by bark.

Several factors led to selection of coal as the second fuel, including favorable cost, good quality and a 30-yr supply. As a result of observations at a number of plants it was concluded that coal should be fired by a spreader stoker and bark by a pneumatic spreader.

The Influence of Volatile Matter on the Combustion of Pulverized Coal, J. F. Mullen, combustion engineer, Combustion Engineering, Inc., Windsor, Conn., and Gregory Gould, consulting engineer, Fuel Engineering Co., New York, N. Y.

A particle of solid fuel initially exists as a heterogeneous chemical substance consisting primarily of carbon, hydrogen, oxygen, nitrogen, sulphur and inert matter. As this particle enters a high-temperature-furnace atmosphere rich in nitrogen and oxygen, it is transformed both physically and chemically into gases.

The finer a coal is ground and the higher the volatile content, the steeper is the initial rise in the combustion curve. During the time the particle is approaching the flame front it is being heated rapidly; the higher the coal air temperature and the smaller the particle size the more rapid is the rate of volatile release and the shorter the period for the volatile matter and the carbon to reach ignition temperature and proceed to a maximum release rate.

The Comparison of Sulphur Analyses by Combustion Tube and Eschka Methods Using Coals from Various Seams and Varying Sulphur Content, E. J. Sandy, assistant professor, School of Mines, West Virginia University, Morgantown, W. Va.

A study at West Virginia University to investigate the relative accuracy of the tube-furnace method as compared to ASTM's Eschka method for determining sulphur content in various coals shows that the presence and amount of chlorides appear to affect the reliability of the combustion-tube method. Unless a correction is made for the chlorine content of the coals, the results will in many cases place the value beyond the tolerances specified by the ASTM. There appears to be no general correlation between the coal seams from which the samples originated and their chlorine content.

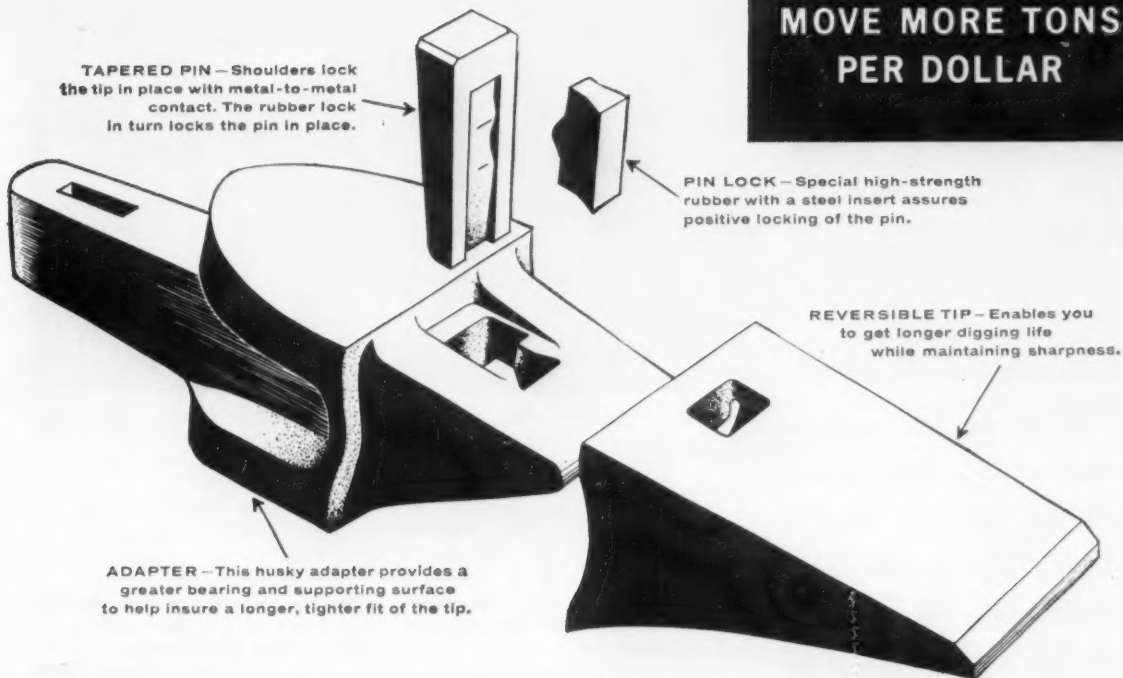
Our Knowledge of the Current Status of Underground Gasification in Russia, C. D. Pears, head, analysis and measurements section, Southern Research Institute, Birmingham, Ala. and M. H. Fies, consultant, coal operations, Alabama Power Co., Birmingham, Ala.

It appears from the literature and a detailed study of experimental data that the USSR does have an operating process of underground gasification in brown coal. Although some Russians seem to think that more scientific work is necessary and that the economics are still not favorable even for the USSR, the preponderance of opinion seems to be that the cure is simply in larger installations. By U. S. standards the process does not look economically attractive unless even thicker (20 ft) lignite beds can be gasified. The USSR is planning work in such seams.

Detailed data are not available to permit an accurate study of the variables versus time. Little is available on the recovery of the total energy or per generator or even per borehole. From the data that are available it is difficult to understand the great reduction in cost anticipated for gas from underground gasification in the next few years.

It appears that the USSR is planning an expanded program both in brown and hard coal with every intent of developing a commercially competitive process for the production of energy.

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Now you can save hours of costly shovel downtime . . . by using this new AmSCO Simplex 2-Part Tooth. Simplex tips are quickly reversible to give added tip life while retaining sharpness. And when teeth eventually become worn, just knock out the retaining pin and replace with a new tip.

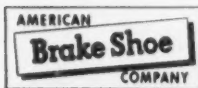
Simplex adapters fit this new 2-part tooth to *any* AmSCO dipper or backhoe. And because AmSCO makes both dippers and dipper teeth, you can be sure of proper fit between the adapter and shovel lips.

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KMI Holds 21st Annual Meeting

Coal men from east and west Kentucky gather to hear talks on new mine developments, mining methods, safety, mine fires and explosions, and new maintenance materials.

KENTUCKY MINING INSTITUTE, representing the nation's third largest coal producing state, held its 21st annual meeting at the Phoenix Hotel, Lexington, Ky., Nov. 3-4. Attending were some 200 mine officials and manufacturer's representatives.

At the first business session H. B. Jones, institute president and general manager, Eastern Coal Corp., Stone, Ky., appointed a special resolutions committee to make a study of what the institute can do, through research, to find new uses for coal. Resolution committee members are as follows:

A. D. Sisk, U. S. Bureau Mines.

Harry LaViers Jr., South-East Coal Co.

Troy Back, Federal Coal-Mine Safety Board of Review.

W. H. Roll, Kentucky School of Mines.

In the business session closing the meeting, members elected officers as follows:

President—Edwin McGaw, West Kentucky Coal Co., Madisonville, Ky.

First Vice President—Noah Mayhew, Blue Diamond Coal Co., Leatherwood, Ky.

Second Vice President—E. B. Taylor, High Splint Coal Co., High Splint, Ky.

Third Vice President—H. O. Zimmerman, Inland Steel Co., Wheelwright, Ky.



THURSDAY SESSION—Paul Lingo (left), West Virginia Dept. of Mines; H. B. Jones, Eastern Coal Corp.; Frank Heinze, Turner-Elkhorn Mining Co.; Herman E. Knight, West Kentucky Coal Co.; Noah D. Howard, Elkhorn Coal Corp.; and Vernon Hendrickson, Pittsburg & Midway Coal Mining Co.

Secretary-Treasurer — A. H. Mandt, Kentucky Department of Mines & Minerals, Lexington, Ky.

Directors—W. T. Cahoon, Carrs Fork Coal Co., Allock, Ky.; William Crawford, Princess Elkhorn Coal Corp., David, Ky.; James H. Graham, Jewell Ridge Coal Co., Tilford, Ky.; Vernon Hendrickson, Pittsburg & Midway Coal Mining Co., Sturgis, Ky.; C. H. Irwin, International Harvester Co., Drift, Ky.; H. B. Jones, Eastern Coal Corp., Stone, Ky.; R. D. Jones, Kentland-Elkhorn Coal Co., Dunlap, Ky.; Harold Kirkpatrick, Beech Creek Coal Co., Green-

ville, Ky.; Herman E. Knight, West Kentucky Coal Co., Madisonville, Ky.; Harry LaViers Jr., South-East Coal Co., Irvine, Ky.; B. F. Reed, Turner-Elkhorn Coal Co., Drift, Ky.; B. W. Whitfield III, Harlan Collieries, Harlan, Ky.; and Norman Yarborough, Harlan Fuel Co., Harlan, Ky.

Noah D. Howard, Elkhorn Coal Corp., Whiteburg, Ky., and Herman E. Knight, West Kentucky Coal Co., Madisonville, Ky., were co-chairmen of the Thursday technical session. Co-chairmen of the Friday session were Norman Yarborough, Harlan Fuel Co. and Elmer T. Queen, Russell Fork Coal Co., Elkhorn City, Ky. R. L. Vines, Kentucky Department of Mines & Minerals, Lexington, Ky., and H. Elkins Payne, U. S. Steel Corp., Lynch, Ky., were co-chairmen of the program committee.

Abstracts of the technical papers follow:

Safety Records in Small Mines, Frank Heinze, Turner-Elkhorn Mining Co., Drift, Ky.

"Safety in a mine, any size mine, cannot be bought or legislated. It must be achieved by persistence in working out a good program."

In the past few years there has been a steady growth in the small-mine industry in eastern Kentucky. In 1956 there were 378 mines employing less than 15 men in Floyd County and in 1959 the number increased to 461. The medium-sized mine—employing from 25 to 100 men—is almost nonexistent. Mines today are either large operations or very small units employing from 4 to 15 men.

Floyd County has approximately 2,500



EDWIN MCGAW, West Kentucky Coal Co., was elected president of KMI for 1960-61.



FRIDAY SESSION—Everett Brown (left), Kentucky Dept. of Mines and Minerals; Harry LaViers Jr., South-East Coal Co.; C. H. Irwin, Wisconsin Steel Coal Mines; J. B. Long, Long-Airdox Co.; Fred Loving, Kentucky Ridge Coal Co.; Elmer T. Queen, Russell Fork Coal Co.; and Norman Yarborough, Harlan Fuel Co.

men employed in small mines. It is evident that the income derived from these mines constitutes a very important part of the economic picture in this country. The same situation exists all over eastern Kentucky.

The small mine is not any more hazardous than a large one. Increased mechanization creates a lot of dangerous conditions that do not exist in a small mine. There has been a lot said about small mines having a bad safety record. Those critical of the small mines always point out that the larger mines produce more tons of coal per fatality. It is not fair to make a comparison on this basis. The production per man day in the small mine—operating in 26- to 30-in coal—is substantially less than production per man per day in the larger mines operating in thicker seams—usually two to three times greater.

Increased mechanization has reduced the exposure hazard. It follows that with the reduction in exposure that accidents were reduced. While the tons mined per fatality has increased, the fatalities per million hours of exposure has not really improved much in the larger mechanized mines. In 1949 the fatality rate for all bituminous coal mines was 0.91 per million man-hours worked and in 1959 it was 0.92.

Fatality rate of small mines in Floyd County for a 2½-yr period from Jan. 1, 1958, through June 30, 1960, was 1.21 per million man-hours worked. This is a better rate than the entire membership of the Big Sandy-Elkhorn Coal Mining Institute for the same period, which was 1.32 fatalities per million man-hours worked.

Mine Fire at No. 22 Mine, Holden, W. Va., Paul Lingo, West Virginia Dept. of Mines, Charleston, W. Va.

"The exact cause of the fire on March 8, 1960 will probably never be known. Evidence and findings indicate that an arc, sparks or metal slivers which resulted from an electrical short circuit set fire to one or more wooden roof supports."

Recommendations for preventing a repetition are:

1. Multiple overcasts be utilized to prevent extremely high air velocities.

2. Every effort should be made by all underground personnel to prevent fires by known safety practices.

3. Barricading materials be made available to all underground working sections and employees be trained to use such materials.

4. Development of a nonconductor type of communication system be encouraged for underground use.

5. Major changes in escape routes should be reported to the district mine inspector immediately.

6. All underground employees be continually instructed as to the location and condition of all possible escape routes.

The mine was released by the department Sept. 19, 1960.

Development of DeKoven Mine, Vernon Hendrickson, Pittsburg & Midway Coal Mining Co., Pittsburg, Kansas.

The DeKoven mine was developed by our company after the coal reserves had been turned down by other operators due to the presence of faults and extreme grades that were known to exist in the West Kentucky No. 9 seam.

The seam was approached by sinking three slopes on approximately an 18 deg grade. Length of these slopes is about 900 ft. One slope is used for air, another for belt haulage and the third for supplies and also as an air intake.

The conventional room-and-pillar system is used. Panel entries are turned on 825-ft centers and consist of five headings on 50-ft centers. Rooms are driven on 45-ft centers 22 to 26 ft wide.

The mine for the most part is an all-belt operation. Shuttle cars are used at the face. Conventional mining equipment consists of rubber-tired universal cutters, tractor-type loading machines, rubber-tired roof- and coal-drilling machines and four-wheel-drive shuttle cars. All equipment is powered by AC except one (extra) complete face unit and 14 DC shuttle cars.

Roof is supported with 30- and 36-in roof bolts. Props also are used in belt entries and main air courses.

The mine is ventilated by the exhaust system using a high-pressure fan. Water gage is 11½ in.

Coal is conveyed by an overland belt conveyor to a raw-coal stockpile having a capacity of more than 15,000 tons. This coal is fed to the cleaning plant at a designated rate up to a maximum of 1,000 tph. The plant is of a twin-circuit design equipped with conventional jigs, vibrating screens, etc. Clean coal is stockpiled in an open storage area with a maximum capacity of approximately 50,000 tons. Coal can be loaded into railroad cars or can go by overland belt conveyor to river-loading facilities.

Full Dimension Mining, J. B. Long, Long-Airdox Co., Oak Hill, W. Va.

"Full Dimension" is a new conveyor system that permits multiple-shift production with no transportation delays. It is the first and only extensible conveyor system with (1) articulated reach sufficient to mine multiple headings from a single conveyor, (2) pillaring ability in a wide variety of conventional and non-conventional patterns, (3) capacity up

to 12 tpm, (4) ability to handle lump and rock, (5) adaptability to conventional loading as well as continuous mining, and (6) individually proven simple components—no Rube Goldberg ideas."

Components of "Full Dimension" mining include loader or continuous miner, bridge conveyors, mobile bridge conveyor, mobile chain conveyor (feeder), mobile-conveyor belt-tail combination, belt conveyor, belt stations, and belt-conveyor drives.

Full Dimension developed principally out of the Piggyback conveyor system, but the two systems are quite different in operation. Some of the main advantages of Full Dimension over Piggyback are (1) elimination of panups—one belt extension takes the place of 24 panups, (2) higher capacity—since the chain conveyor never exceeds 150 ft, drives of practical size can readily handle 10 to 12 tpm, (3) provides a minimum of six working places in the conventional cut pattern, (4) mobile auxiliary equipment has free access for movement from place to place, no crossing of pan lines, (5) pillaring systems are practical for the first time in conveyor mining, and (6) room depths may go to 1,000 ft or more.

Discussion: Fred Loving, Kentucky Ridge Coal Co., Field, Ky.

Mr. Loving described his company's method of mining with Piggybacks dating back to 1956. Production averages 29.88 ton per face man. The Piggyback system permits 75.87 recovery of coal. He stated that "Full Dimension" mining is adaptable to continuous miners with improvement in production and costs.

C. H. Irwin, Wisconsin Steel Coal Mines, Benham, Ky.

While Wisconsin Steel company has not had any experience with Full Dimension Mining, it has had some 6 yr experience with the bridge conveyor system. Introduction of mobile loading machines with bridge conveyors and room chain conveyors was started in 1954. Experience with this type of equipment under the mining conditions existing at the operation was favorable and efficiency improved some 30% per man employed at the mine.

Development of South-East Coal Company's Deep Mine, Harry LaViers Jr., South-East Coal Co., Irvine, Ky.

"We feel that the potential of continuous mining is just now being touched upon. We also feel that this increased potential will be an evolutionary thing rather than the revolutionary change which we have just experienced."

Operating three deep mines with a 1959 output of 850,000 tons, South-East employed six Lee-Norse CM33X miners and one Joy Super 14BU unit.

Conventional units, 11-man crews, averaged 300 tons per machine-shift in 1956. In 1959 with continuous miners and 6-man crews the company increased

tonnage to 325 tons per machine-shift. The percentage of salaried employees increased markedly as a result of cuts in crew size. This and other developments resulted in an increase in fixed overhead. However, there was only a slight increase in output of $\frac{3}{4}\times 0$ coal—22 to 26%—though as a result of more natural output of 2×0 and less crushing the percentage of $\frac{3}{4}\times 0$ in the shipped product is actually less. Hardgrove grindability of the $\frac{3}{4}\times 0$ increased, but there was no change in the washability of the raw coal beyond a rise $\frac{1}{2}$ percentage point in the reject, thought to come from a certain unavoidable cutting in the top rock.

Use of miners has slightly cut per-ton maintenance cost, with a major saving in cable cost in addition to others. Experience with the miners showed a need for a new section haulage setup to ease the problem of moving loading points and also keep distance down. Section belts were the answer. Development work has been cut and concentration also has permitted a better job of track-laying. On the other hand, power and air costs are up, and qualified operating and maintenance men are not yet available in the necessary numbers.

New Insulating Materials and Their Use in the Maintenance of Motors and Generators, J. O. Sherrard, National Electric Coil Co., Columbus, Ohio.

Insulation resistance of fields and armature windings should be measured with a good megger and readings recorded at least monthly. Brushes and brush holders should be checked weekly.

Bearings and gear center distances should be kept within recommended permissible operating tolerances, bearing in mind the close relation between mechanical and electrical maintenance.

Commutators and the area adjacent to them are a potential source of failure, primarily because of possible accumulation of conducting dirt or carbon dust.

New materials are being used industry-wide in new motors and generators, and in many cases lend themselves remarkably well to the overhaul of existing equipment without replacing electrical windings. These new materials are epoxy resins and polyesters. Their development by the plastics industry has led to a new concept for insulation of electrical rotating machines. Epoxy resins used to insulate diesel locomotive motors and generators have done an outstanding job under extremely severe operating conditions. Temperatures can range from well below freezing, when starting, to an excess of 180 C in the windings due to sustained overloads. The value attached to the use of these new resins can best be understood by the fact that manufacturers confidently expect to attain a winding life of ten times that considered normal a few years ago.

The next step was to develop them

for armature coils and for complete armature vacuum impregnation. The result has been to attain:

1. High thermal stability.
2. High thermal conductivity for cooler operation.
3. Chemical inertness to moisture, acids, alkalis, lubricants, diesel fuels and solvents—particularly chlorinated solvents commonly used for degreasing and maintenance cleaning.

Glass banding tape has replaced wire bands. The tape is itself an insulation, molds readily to the armature coil configuration and is unaffected by continuous operating temperatures up to 150 F.

Manufacturers now use silver-bearing copper for the commutator bars, which increases the mechanical strength and raises the annealing temperature. The segment and vee-ring mica is no longer shellac-bonded, but instead an alkyd-vinyl bonding agent is used.

Mine Fires and Explosions, Everett Brown and Willard Stanley, Dept. of Mines and Minerals, Lexington, Ky.

Since the last meeting of the Kentucky Mining Institute, 14 mine fires have occurred in or about Kentucky coal mines. There have been no explosions, nor has any loss of life resulted from any mine fire.

In summary there were three tippie fires, two underground belt fires, one fire in an abandoned area of an active mine, another in an abandoned mine, and seven underground fires caused by electrical arcs or short circuits. The following recommendations are made to prevent mine fires:

1. All conveyor belting should meet the specifications for "fire-resistant" belt and should be equipped with centrifugal switches or other devices which will stop the belt in the event of excessive slip-page.

2. Machinery cables should be suspended or otherwise placed so as to prevent their being run over. They should be fused at the nip.

3. "Fire-resistant" hydraulic oil should be used in all hydraulic equipment only by companies which have an adequate maintenance program for hydraulic equipment and those which have discussed the use of this oil with the manufacturer.

4. Curtains should not be used across haulageways. Trolley wires should be maintained in a workman-like manner.

5. Good housekeeping should be practiced.

6. Cable splices should be made in a workman-like manner and all cables with more than six temporary splices must be removed from service and the splices improved.

7. Centrifugal switches and other protective devices should be provided for belts, and fire extinguishers must be maintained in operating condition at all times.



PUMPING, ROCKDUSTING, MONITORING—R. R. Godard (left), and R. C. Beerbower Jr., U. S. Steel Corp., Uniontown, Pa.; G. L. Alston, Mine Safety Appliances Co., Pittsburgh, Pa.; Kenneth Hobbs, Eastern Gas & Fuel Associates, Helen, W. Va., session co-chairman; William Connley, Hanna Coal Co.; and Cleon Fowler, Pocahontas Fuel Co., session chairman.

West Virginia CMI, Appalachian Sec. AIME Meet at The Greenbrier

NEW MACHINES, better materials and methods to improve mining efficiency highlighted the annual meeting of the West Virginia Coal Mining Institute and the Central Appalachian Section, AIME, held Nov. 4 and 5 at The Greenbrier, White Sulphur Springs, W. Va. The two-day meeting drew some 200 executives, engineers and guests.

Chairman of the program committee was John L. Schroder Jr., Coal Div., U. S. Steel Corp., Lynch, Ky. W. J. Skewes, chairman, Central Appalachian Section, AIME, presided at the Friday luncheon and Stephen F. Dunn, president, National Coal Association was guest speaker. Stephen Canonico, vice president, West Virginia Coal Mining Institute presided at the banquet and Harry A. Stuhldreher, assistant to vice president, personnel services, U. S. Steel Corp., was guest speaker.

Chairmen and co-chairmen of the technical sessions were:

Cleon Fowler, general manager of mines, Pocahontas Div., Consolidation Coal Co., Pocahontas, Va.

Kenneth Hobbs, superintendent, Statesbury No. 10 mine, Eastern Gas & Fuel Associates, Helen, W. Va.

W. A. Stapleton, superintendent, Moss No. 3 mine, Clinchfield Coal Co., Dante, Va.

H. O. Zimmerman, manager, coal properties, Inland Steel Co., Wheelwright, Ky.



NEW DEVELOPMENTS—H. O. Zimmerman (left), Inland Steel Co., Wheelwright, Ky., session co-chairman; W. F. Diamond, Island Creek Coal Co., Holden, W. Va.; J. H. Fletcher, J. H. Fletcher & Co., Huntington, W. Va.; and W. A. Stapleton, Clinchfield Coal Co., Dante, Va., session chairman.

E. M. Spokes, professor of mining engineering, University of Kentucky, Lexington, Ky.

J. B. Kebblish, division superintendent, Mountaineer Coal Co., Monongah, W. Va.

In the business sessions, officers were elected as shown in the accompanying panels. It was announced that Central Appalachian Section, AIME, scholarships for study of mining engineering were held by Michael J. Hudak Jr., West

Virginia University, and Marvin H. Bishop, Virginia Polytechnic Institute.

Technical sessions included papers as follows:

Pumping Coal and Refuse at the Georgetown Preparation Plant of the Hanna Coal Co., William Connelly, plant engineer, Georgetown plant, Hanna Coal Co., Georgetown, Ohio.

About 4 yr ago we became interested in pumping refuse and after visiting sev-



FOREST MANAGEMENT, COAL SALES—D. C. Snyder (left), C. H. Sprague & Son Co., New York, N. Y.; J. F. Tillinghast, Tillinghast and Reed, Danville, Va.; J. G. Jennings, Island Creek Sales Co., Huntington, W. Va.; J. W. Kepler, Consolidation Coal Co., Pittsburgh, Pa.; J. B. Kebblish, Mountaineer Coal Co.; and E. M. Spokes, University of Kentucky.

eral plants where the total reject was pumped to a disposal area we decided to crush our 7x1½ jig reject to minus 1½ in and pump our total plant reject.

Our next approach to our pumping problem was to present it to several pump manufacturers and obtain their recommendations for our specific requirements. The only difference in each recommendation was in efficiency and power, the dredge-type pump being capable of passing larger pieces through the eye of the impeller with resultant loss in efficiency and the other type of solids-handling pump had higher efficiency but was somewhat limited to the size of particle that can be safely pumped.

An impactor-type crusher was selected to reduce our 7x1½ refuse to minus 1½ in. While the crushed product met every specification, the maintenance cost of hammer repairs was excessive. So far the best hammer life we have obtained is about 60 operating shifts of 7¼ hr and the material cost at this rate will be \$600 per month. Add to this figure labor, power etc. and our crushing cost was averaging \$1,000 per month.

The maintenance cost of 12-in spiral-weld pipe connected with flexible couplings was becoming prohibitive so we installed different types of pipe to determine which would be best for our refuse pumping problem. At the present time our tests are not complete to determine which pipe is best.

It would appear that under our conditions the percentage of material that could be pumped with some degree of security would be in the neighborhood of 15% solids.

Our next venture at pumping solids included the problem of pumping approximately 400 to 600 tph of ¾x0 coal. We are using 1,150 ft of 14-in pipe and two pumps discharging into the same line to

obtain the necessary velocities to convey the coal. We are operating at 15.5 fps on clear water with a slurry velocity of 14.2 fps. We have been pumping the total ¾x0 from our plant to our pipeline at an estimated cost of 5¢ per ton compared to 15¢ per ton for trucking.

New Officers

West Virginia Coal Mining Institute

President—Stephen Canonico, vice president, Compass Coal Div., Clinchfield Coal Co.

Vice Presidents—J. L. McQuade, Maust Coal & Coke Co.; N. T. Camicia, Island Creek Coal Co.; Harold Suter, Christopher Coal Co.; D. C. Ridenour, Olga Coal Co.; and Quin Morton.

Executive Board—Harry Quenon, Eastern Gas & Fuel Associates; R. C. Luther, Pocahontas Fuel Co.; C. R. Nailler, Christopher Coal Co.; George McCaa, Hanna Coal Co.; R. C. Lazzell, Island Creek Coal Co.

Secretary-Treasurer—G. R. Spindler, West Virginia University.

Central Appalachian Section, AIME

Chairman—D. A. Zegeer, Bethlehem Mines Corp.

Vice Chairmen—F. R. Toothman, Chesapeake & Ohio Ry.; R. C. Luther, Pocahontas Fuel Co.; and J. L. Schroder, U. S. Steel Corp.

Executive Committeemen—E. M. Spokes, University of Kentucky; W. S. Hannan.

Secretary-Treasurer—C. T. Holland, Virginia Polytechnic Institute.

Reducing Cost of Rock Dust Application, G. L. Alston, product line manager, Mine Safety Appliances Co., Pittsburgh, Pa.

About 2 yr ago we began a study to see what could be done to take the manual labor out of rockdusting, which we felt was by far the greatest part of the cost. The answer to the problem was to completely eliminate the bagged rockdust by transporting the dust from the quarry to the mine in bulk railroad cars or trailer trucks, dumping the bulk dust directly into mine cars and transferring the dust from the mine cars into the rockdust distributors. A full description of this method appeared in *Coal Age*, August, 1960, p 104.

Remote Monitoring and Control of Mine Ventilating Fans and Power Substations, R. C. Beerbower Jr., general superintendent, and R. R. Godard, assistant chief engineer, Frick District, U. S. Steel Corp., Uniontown, Pa.

Robena mine encompasses about 16,000 acres and presently includes over 165 mi of main intake airways, approximately 60 mi of which are primary rail haulage roads, and 164 mi of return air courses plus 60 mi of bleeder entries.

The high rate of methane liberation, about 6 million cubic feet per day, necessitates a ventilation system second to none. Ventilation is accomplished with seven fans plus a standby.

In Robena no personnel are employed as full time fan or substation attendants. Thus a remote fan-monitoring and substation-control device was a necessity. To meet this need a carrier-current indicating and control system manufactured by Femco, Inc. was installed several years ago.

During early operation these systems performed as anticipated. However, as working areas advanced farther into the

field, the telephone circuit to which this equipment was connected extended to greater distances; carrier frequency signal attenuation, normally not excessive in moderate lengths of multiple pair cable, became sizable. It became apparent that retention of equipment reliability under these conditions necessitated optimum system performance.

Although maintenance costs were higher than desirable, they had not reached a level justifying employment of full time attendants. A better way had to be found. This resulted in investigation of the Femco Circuit Scanner.

The Robena system has a central office unit which is equipped to monitor 10 fans and control and indicate position of a total of 30 remote circuit breakers. The system has been in service a year and has demonstrated reliability suitable for the application and has yielded significant reduction in maintenance cost.

Use and Advantage of Mechanical Track Tamping Equipment, J. R. Fletcher, president, J. H. Fletcher & Co., Huntington, W. Va.

Mechanized tamping of underground mine track was first put into operation at Mathies Coal Co., Finleyville, Pa., in the summer of 1959. The Model TTA-7 tamping machine has four air hammers mounted on a sliding frame enabling the operator to compact ballast at each rail-tie intersection with a single positioning of the head. Each tool has a stroke of 8¼ in, impact of 11½ lb per blow and produces 1,400 blows per minute. After three or four insertions at a rail-tie joint, the head is lifted hydraulically, moved by cross-slide to the opposite end of the tie and the operation repeated. A tie can be tamped every 75 sec.

A vital part of track tamping is leveling. This is accomplished by side jacks pressing between the ground and the machine. Alignment can be by hydraulic jack swung out between the rib and the tie end.

The tamping machine has proved equally effective in laying new rail and maintaining existing track. In general, it reduces the hand tamping crew, which may number five men, to an operator and track liner. Tamping quality is consistent. With the machine providing the labor, end-of-shift lag is eliminated. The machine consistently performs at a rate better than 400 ft per shift.

Island Creek Coal Company's Experience with Plastic Coated Conveyor Belting, W. F. Diamond, manager of engineering, Island Creek Coal Co., Holden, W. Va.

An order was issued for a 480-ft length of 30-in plastic-coated belting in April, 1955 and when it was delivered in July, it was installed on a conveyor in our No. 7 mine. This mine was se-

lected because conditions were such that we would find out rather quickly whether or not the belt had merit.

During the period it was under test, periodic inspections were made. Because of the thin cover at the belt edges, the PVC was rather quickly worn away and the fibers making up the edge roll were abraded to the point where they broke.

Our operating people were certain that the belt would not last out the butt entry. Examination and measurements showed a maximum loss in width of ¼ in and although there were a number of nicks in the cover, none was larger than ¼ in in diameter and there was no evidence of fabric damage.

Our operating people were still skeptical and did not feel that they were willing to take a chance on purchasing the new belt without additional testing. Fortunately we were getting experience with the plastic-coated belt at another mine.

As a result of experience at both operations, our operating people came to the realization that if you do not rip them you do not have to repair them and here was a belt that could take it.

The lightness in weight makes it easier to handle. It has superior fastener holding power. The basic construction of the carcass makes ply separation impossible.

The only significant disadvantage of the plastic coated belt is the tendency for the belt to slip under the load under certain conditions, and this disadvantage is recognized by the manufacturers. They have produced an experimental belt with heavier covers in which the PVC has been compounded to yield a softer, more resilient surface.

The Economic Aspects of Forest Management for Coal Properties, John Tillinghast, consulting forester, Danville, W. Va.

Land managers who deal mainly in coal, gas, oil or mineral resources, tend to think of timber as similar to these resources. They think of timber as a stagnant product, neither growing nor depreciating, and once harvested, gone forever. Too often neither owner nor lessee is aware of the economic potential of timber and a property is allowed to deteriorate almost beyond recall.

Most West Virginia timber lands have been cut over repeatedly and, by scientific standards, are in poor condition to grow timber at a profit. These standards require renovation to remove culls, trees of poor form, undesirable species and to thin stands that are too dense for optimum growth.

Under good management 300 board feet per acre per year should be attainable on most large properties with adequate rainfall and it is logical to expect not less than \$10 per thousand board feet for stumpage from managed stands.

This being the case, you should be safe in betting on an average stumpage return of at least \$3 per acre per year once your property has developed a full stocking of well formed growing stock in the various necessary age classes.

The Methods and Problems of a Progressive Coal Sales Organization, J. V. Kepler, vice president, sales, Consolidation Coal Co., Pittsburgh, Pa.

The bituminous coal market is mainly a struggle between coal, oil and gas. Perhaps no industry has the severe competition coal has because coal must compete with discard products.

To be successful, a sales organization needs good management. This job involves, among other things, delegation of authority. There also must be divisional sales managers who are responsible for knowing the marketing pattern in the various areas. They must continually review the market and plan ahead.

There is room for good trade relations. Efforts should be made to provide the best product to the customer and to provide good service.

A major problem of the coal industry is that it has no control over transportation costs. In the past 12 yr the price of northern West Virginia coals has increased 40¢ per ton and Btu value increased 4½%, but freight cost increased \$1.25 per ton, or 33%. Other problems are the high labor cost of mining and preparing coal, overcapacity and the brutal competition of residual oil.

Courage is especially needed in coal sales. We can have a successful and proud industry if we have it.

In discussing Mr. Kepler's paper, Mr. J. G. Jennings, Island Creek Sales Co., Huntington, W. Va. said that to develop and perform the function of selling it is necessary to first go to the grass roots and analyze the market in terms of tonnage potential and price. This information then must be put together by districts and a sales organization set up.

In domestic marketing a salesman makes about eight calls per day and in the industrial market he makes five to six calls. With this in mind, call frequencies can be developed. A balance must be maintained between established customers and potential customers in setting up a sales territory.

In further discussion of Mr. Kepler's paper, D. C. Snyder, C. H. Sprague & Son Co., New York, N. Y., noted that coordination between sales and production can not be emphasized too strongly. The coal industry has a job to do in research, public relations and education.

C. H. Sprague is in world markets and American coals are gaining momentum in every direction. Quality is the most important item in foreign markets. In the next 4 or 5 yr foreign markets may consume up to 50 million tons of our coals.

Research and Operations in Coal Aided by Radioisotopes

Radioactive byproducts of the nucleonics industry energize automatic controls in coal production processes and provide tracers for more precise measurement and studies of reactions in coal-utilization research.



What are radioisotopes?

"Radioisotopes are simply unstable atoms that do not differ chemically from stable isotopes of the same element, but do have a different nuclear structure, one that cannot exist indefinitely in nature. This unstable structure breaks down and in so doing emits radiation, perhaps the heavy, intensely-ionizing but short range alpha particles, perhaps the light beta particle that can penetrate or be reflected from thin materials, and also in most cases the very penetrating gamma rays . . .

"Depending upon the instability of the original nuclear structure, this radiation is emitted over periods, measured by 'half lives,' ranging from a millionth of a second up to trillions of years. The energies of the radiations from different radioisotopes vary over a great range. Thus, gamma radiation from certain isotopes will barely penetrate the thinnest aluminum strip, while other isotopes emit gamma rays that can easily penetrate 6 in of armor plate."—Dr. Paul C. Aebersold, director, Office of Isotope Development, Atomic Energy Commission.

Coal applications

The foregoing definition of radioisotopes by Dr. Aebersold keyed a coal-industry meeting Nov. 17 at Pittsburgh under joint sponsorship of the American Mining Congress and the Atomic Energy Commission. The followup by speakers at the all-day session (see panel) included a review of possible applications of radioisotopes in mining, cleaning and utilizing coal, and the introduction of a comprehensive report on these matters which was prepared by BCR and Dr. H. J. Rose for the Office of Isotopes Development. The 233-p report, containing a full survey of the literature, lists 110 suggestions for possible uses. The report is available from the Office of Technical Services, Dept. of Commerce, Washington 25, D. C., at a price of \$3. It is entitled "Potential Applications of Radioisotopes to the Mining, Preparation, Transportation, Storage, Handling and Use of Coal."

AEC-AMC Speakers At Pittsburgh

- J. R. Garvey, vice president, Bituminous Coal Research, Inc., Pittsburgh, Pa.
Paul C. Aebersold, director, Office of Isotope Development, Atomic Energy Commission, Washington, D. C.
Charles O. Badgett, chemical industrial manager, Industrial Nucleonics Corp., Columbus, Ohio.
A. J. Stevens, president, Radionics, Inc., Boston, Mass.
Philip E. Ohmart, president, The Ohmart Corp., Chicago, Ill.
O. K. Neville, vice president, Nuclear-Chicago Corp., Chicago.
P. J. Blaetus, chief, Isotope Technology Training Branch, Office of Isotope Development, AEC, Washington, D. C.
Harold J. Rose, consultant, Pittsburgh, Pa.

In addition to present uses of radioisotopes in density control in preparation plants, there exist possible applications in continuous moisture and ash determination, leading to fully-automatic plant operation. The prospect is that it may become possible to preset a series of controls to cause plant equipment to turn out x tph of clean coal to strict ash and moisture specifications. A change in these specifications would be met by resetting the controls.

In applications other than coal preparation, radioisotopes may have great value in borehole logging for property evaluation. Radioactive well-logging has been widely used in the oil industry. Variations of these techniques would be useful and economical in determining local variations in coal-bed thickness, variations in chemical and physical characteristics of the coal, variations in dip and strike which affect drainage and haulage and variations in the nature of roof and floor. Core drilling still would be required to recover samples, but radioisotope probing of other cheaper holes could provide knowledge of local variations. Furthermore, deep wells in

coal regions might be logged by nuclear probing for the purpose of determining "reserves" to a more accurate degree.

Mine surveying is another activity in which radioisotopes may serve. For example, power boreholes sometimes miss the entry they should intersect—and in an unknown direction. A radiation source could be lowered into the borehole and located from the entry by a detector. These methods have been used in Britain to create a network of intersecting vertical and horizontal boreholes in gasification experiments.

At the production face

Visibility is poor at continuous-mining faces. It may be possible to develop rugged sensing probes which will permit continuous-mining machines to automatically maintain a predetermined distance of cutting head from roof and floor. Possible techniques are (1) a density probe based upon gamma-ray reflection, (2) a natural gamma radiation probe based upon the fact that shales usually emit several times as much natural radioactivity as coal, (3) a hydrogen probe based upon the difference in the hydrogen content of rock compared with coal and (4) an oxygen activation probe based upon neutron bombardment to produce a detectable oxygen isotope (coal and rock vary in oxygen content).

Sensing probes may be developed which will stop a mining machine when it runs into a want, fault or pinch. Such techniques and equipment may possibly be extended into the development of a true remote-control system.

The performances of various shooting patterns may be determined by using selected radioisotopes in selected drill-holes. The temporary radiation from short-lived isotopes could be measured in the broken coal after shooting to show the effectiveness of the blast action from the marked holes. Such tests could be made in acceptable safety by trained personnel. Other countries, including Russia, are at work on problems like these. As an aid to safety, harmless isotopes could be included in explosives during manufacture. Detection devices

then could be used after the blast to locate undetonated charges.

In haulage systems

Studies of the art indicate that nuclear devices can be useful in controlling the level of loading in mine cars, hoppers, skips, belt conveyors and so on.

They also may be used to determine moisture in floor clays, thus predicting floor strength and behavior under certain types of haulage. Isotope techniques can be applied to counting mine cars, shunting cars containing coals of differing quality, continuous monitoring of raw-coal quality on conveyors and in mine cars and so on. Tamping and compaction in ballast and the condition of wood ties may also be checked.

In roof support

The condition of wooden timbers may be determined by radiation and its detection. Separation of layers in mine roof strata, cracks, moisture content, saturated clay layers, and other conditions, may be detected. Dangerous stresses resulting from the weight of overlying strata are detectable through radiation techniques, leading perhaps to some measure of control on the damage from bumps and outbursts.

The effectiveness of seal coatings and roof cementation provide another outlet, in that a radioactive tracer may be introduced into the roof with injected materials. Thus penetration could be measured.

In ventilation

One suggestion is that radioactive tracers be used to determine the performance of ventilating systems with respect to distribution of air, dilution of methane, rates of flow, leakage detection and so on. Tracers might also be used to study the diffusion and mixing of respirable dust in mine air. And it is possible that radioisotopes could be used to ionize the air used for vacuum collection of coal dust in mines to prevent hazardous accumulations of static electricity on the dust particles. Determining "percent incombustible" in mine dusts is another possibility.

Continuous monitoring of methane emission at the face and studies of methane migration through strata are outlets for nuclear technology using the proper sources and detectors and tracers. Similar methods may be applied to studies of underground water and its migration.

On the surface

Optimum-moisture and maximum-density conditions in strip mine roads may be checked by radiation probes and

detectors already in use in highway construction. Taking off in another direction, radioactive sources are now in use to detect flaws in castings and weldments that are vital to the successful operation of large expensive machines. The use of some of these tools is reserved for the experts, although training is now available through the AEC which, it is hoped, will promote the wider use of available isotopes in industry.

In utilization

The use of tracers is suggested in checking the thoroughness of mixing in coal blending and the degree of segregation in subsequent coal handling. The bulk density of crushed coal charged to coke ovens may be monitored, and safe coke pushing from the ovens may be monitored by gamma-ray interlocks.

The travel of solid fuels through vertical retorts, tracing the movement of heating gases through coke-oven batteries, investigating fluidized suspension processes are examples of studies in which tracers might be valuable aids.

Radiation techniques could be employed to study the distribution of sulfur in its various forms in the products of carbonization. Analysis of coal for trace elements and similar analysis of the products of combustion are possible fields for the application of tracer technology.

In pollution studies

Radioisotopes for tracing and studying air pollutants and otherwise gaining knowledge of air-pollution problems are a distinct possibility. Determinations of the carbon 14 isotope on pollutants in air and water may be useful in determining the proportion of carbon-containing components deriving from recent plant and animal sources or from mineral fuels.

There are opportunities here for a number of methods and various types of instruments.

Are isotopes safe?

"Radioisotopes under industrial use are actually among the safest tools that can be devised. Everything we work with is hazardous to some extent, of course, and isotopes and radiation are no exceptions. But both industry and labor should be aware of the high relative safety of radiation as compared with common industrial hazards, such as, scaffolding, chemical reagents, electricity, live steam, mine cave-ins.

"The reason for AEC's outstanding safety record is that radiation and radioisotopes have certain inherent features that contribute to greater safety. One is detectability. Another is the ease with which radiation can be shielded.

"Radioisotopes do present a hazard and must be regulated to protect those who use them and others. All users must

be licensed by the Atomic Energy Commission. In effect there is no administrative burden involved in the use of 'general license' devices. Such devices are constructed with built-in protective features and, if properly labeled and used only for the intended purposes, can safely be used by untrained persons."

—Dr. Aebersold.

Getting started

"A large body of unclassified research and development information has been released by the U. S. Atomic Energy Commission, and continuing revisions of classification policy have permitted additional declassification of data on a current basis. Research and development reports are available through the AEC Depository Libraries located throughout the United States and many foreign countries and are for sale by government sales agencies. For example, in Pennsylvania there are three centers of atomic-energy knowledge available to you—at Carnegie Library, Pittsburgh, University of Pennsylvania in Philadelphia and Penn State at University Park. Equal resources of nuclear knowledge are available in West Virginia at the University.

"Some available publications are:

Nuclear Science Abstracts; semi-monthly, from U. S. Government Printing Office. Subscription rate, \$33 per yr, including four index issues.

What's Available in Unclassified Atomic Energy Literature, free in return for a letter or postcard to AEC Technical Information Services Extension, P. O. Box 62, Oak Ridge, Tenn.

Isotopes — A Bibliography of United States Research and Application; from the Office of Technical Services, Dept. of Commerce, Washington 25, D. C., at \$2.25 per copy.

"I hope it is clear that the Atomic Energy Commission recognizes the critical importance of education and training programs geared to assure the widespread and safe use of isotopes and radiation. It is our sincere hope that through the collective and cooperative efforts of the industrial and educational communities we may be able to encourage the profitable and routine use of radiation applications throughout the national economy."

—Paul J. Blaetius, chief, Isotopes Technology Training Branch, Office of Isotopes Development, AEC, Washington.

Chairmen of the morning and afternoon sessions, respectively, were Jesse F. Core, vice president — operations — coal, U. S. Steel Corp., Pittsburgh; J. R. Garvey, vice president, BCR, Pittsburgh; D. L. McElroy, executive vice president, Consolidation Coal Co., Pittsburgh and A. E. Seep, president, Mine & Smelter Supply Co., Denver, Colo. Mr. Core is chairman, AMC Coal Division, and Mr. Seep is chairman, AMC Manufacturers Division.

Foremen's Forum

Safety Is What You Make of It

W. H. Bennett, Safety Director, Coal Div., Columbia-Southern Chemical Corp., Midvale, Ohio

THERE have been innumerable articles written about safety, countless numbers of lectures have been delivered on this very important subject, and lifetimes have been spent in teaching and advocating safety, yet accidents continue to occur.

Some 40,000 deaths occur on our highways each year and the same source provides over 200,000 severe injuries per annum. Power lawn mowers continue to chop off toes while Ohio reports that blasting cap tampering results in approximately 100 injuries per year in the state.

The home continues to be a prolific source of injuries and bathtub electrocutions are common. Barbiturate overdoses are recorded almost daily while fires continue to burn and destroy.

The Big Bomb is poised and ready and one questions whether he will ever get out of the world alive.

Against this background you may wonder if accident prevention is worth the time and effort we expend on it. True, if the Big Bomb cracks overhead it won't matter whether the tippie stairway has a handrailing or not, or whether the roof and ribs are tested or not. In this event we can dispense with car seat belts, roof support, and eye protection glasses. But if the prayers of

the world and the good sense of men can prevent the holocaust, the tippie handrail can be very important indeed—it may keep you from breaking your neck. The eye protection and roof control could then be of great value for they might be just the thing you needed.

Safety is a personal thing. True, it is a business and a very important business at that, but basically, safety depends very much upon the individual and his personal attitude.

We can legislate, we can remonstrate, we can demonstrate, but until the matter of safety becomes a personal concern, until a personal alertness to hazards or dangers is achieved adverse statistics will continue to be recorded in our industry.

Gaining the attention of the individual, arousing his mind to his personal responsibility is a tremendous task, but we in industry must meet the challenge.

To be accident conscious is not to be accident fearful—there is a difference. There's nothing cowardly or timorous about recognizing danger before it has walloped us. It's just good sense.

The time to be afraid is before a thing happens. Danger must be anticipated—then prevented. Loose roof, insecurely supported, can fall, persons can trip over material in the walkway but neither will happen if proper precautions have been taken.

Can we gain the worker's attention, alert his mind to hazards, and awaken him to his responsibility for his personal safety?

The only answer I have for that question is that it has been done.

From the cold cash viewpoint we cannot afford injuries. Some of our coal men have realized this fact and are really profiting from a strongly positive safety program.

Management is the key, and we in the safety work are part of management. Recognizing that unsafe conditions and unsafe acts, those twin evil demons of injury cases are responsible for a great portion of accidents, an aggressive program of correction and enlightenment must be put into effect.

The program must be geared to the long range, long pull view if it is to be successful. Example will play a prime role and enforcement of safety practices is a necessity.

It would be ironic in the extreme to escape nuclear destruction and lose one's life by speeding on the highway or by being covered in a roof fall that support would have securely held.

As a footnote let me add that injuries are being made to appear attractive by unrealistic, overgenerous compensation payments. Many minor incidents of no importance are being built into major occurrences because of this factor.

Time for Personal Inventory

RIGHT NOW is the best possible time to take a close look at your personal performance on the job in 1960 with the aim of putting your finger on those areas in which some improvement might be made in 1961. In studying your performance you might ask yourself, in sincere personal criticism, the following questions:

In safety performance . . .

1. Have you had serious accidents in your section during 1960?
2. Have you worked hard at finding the underlying causes of these accidents?

3. What steps have you taken to prevent repeat incidents?

4. Do you notice such shortcomings as poor work habits, loose clothing, dull tools and so on?

5. Do you instantly correct these hazards?

In production . . .

1. Is your unit-shift productivity higher now than a year ago?
2. Have you been able to devise better ways to handle cable, water lines, ventilation installations, etc?
3. Have you done anything to stream-

line the auxiliary operations that back up the face operations?

4. Have you given any thought to these problems?

In maintenance . . .

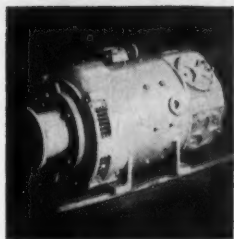
1. Are you now more familiar with the operating characteristics of the machines in your section?

2. Can you direct the proper completion of minor repairs?

3. Do you know the lubrication schedules of the machines in your section?

4. Have you improved over the past year in your ability to troubleshoot me-

The Man & the Motors from Westinghouse



Mr. Westinghouse* matches the extraordinary Long-Airdox mobile coal drilling machine with the industry's most dependable motor

"True, built-in, explosion-proof protection, long-term service and minimum maintenance" are compelling reasons for trusting the machine's power supply to Westinghouse d-c motors. These motors drive hydraulic pumps which actuate hydraulic motors, in turn operating tramming and drilling functions.

The Long-Airdox TDF-10 brings unique mobility to thin seam mines, produces a 9-foot hole in 20 seconds, enables one man to perform both drilling and shooting. Mr. Robert Nelson, vice president, states that the Westinghouse motors, upon which much of the performance of the TDF-10 relies, have established an

impressive record in the face of one of the industry's most demanding chores.

You can be sure . . . if it's Westinghouse.

*Irv Rowe, Charleston, West Virginia, Sales Office

J-22164

Westinghouse



Foremen's Forum (Continued)

chanical and electrical breakdowns?

In cost control . . .

1. Are your total costs lower now than they were a year ago?

2. Do you keep a breakdown of your costs, either in mind or on paper?

3. Have you been able to reduce the costs of any of the necessary operations? Have you tried?

4. Is the responsibility for cost control a burden or a challenge to you?

In employee relations . . .

1. Do you willingly devote time and effort to training new employees in safe practices?

2. Have you kept every promise you made in the past year?

3. Are you reasonably confident at the beginning of a shift that you and your men will turn out a good day's work?

4. Are you giving clearer orders now than a year ago?

5. Can you recognize the difference between an agitator and a sincere complainant?

In personal development . . .

1. Have you gained confidence in your ability to supervise?

2. Are you now doing a better job of planning your work?

3. Can you handle emergencies with greater effectiveness now?

4. Do you really enjoy learning more about mining?

Your Own Rating

What is your verdict with regard to your own supervisory performance? Have you improved to a discernible degree in 1960? The truth of the matter is that you must improve or you will degenerate; there is no middle ground in this.

If you have gained in confidence during the past year it no doubt stems from the fact that you have increasing mastery over the details and routine of your work. The next step in personal development should find you capitalizing on this confidence by projecting new goals for your own achievement in 1961.

The Year Ahead

Here are some guides for 1961:

1. **Set goals**—Very definite goals that will demand a good deal of effort in their attainment are necessary to personal development in supervisory proficiency. Be specific. Don't set a goal of increasing safety; set a goal of eliminating five safety hazards from your section in the first two weeks of the New Year.

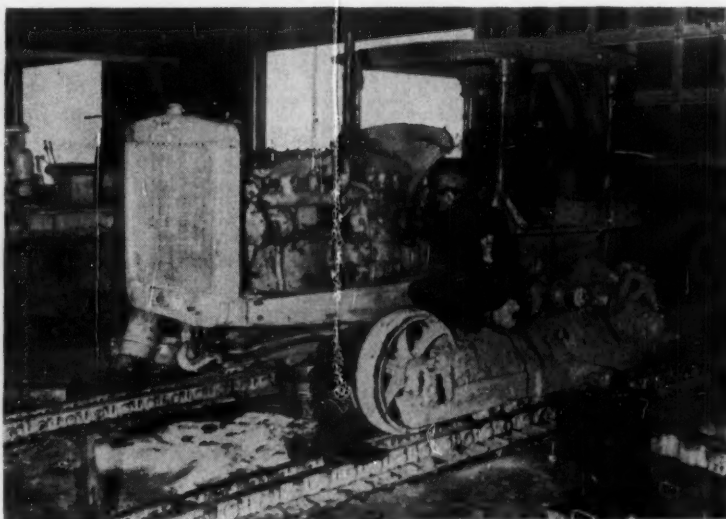
2. **Clean up**—Finish every job you take on, including putting the tools away and cleaning up the refuse that normally remains after work is done. Keep in mind that a job of painting is not completed until the brush has been cleaned and stored. Unfinished jobs complicate any new tasks that are undertaken. Be sure to finish what is started.

3. **Check performance**—Keep tabs on daily performance in safety, production costs and maintenance, for example, in order that you may know when departures from the norm are occurring. Only by keeping such a running account of

your status can you really know when corrective measures are called for.

4. **Study and absorb**—Concentrate on a single subject at a time, reading as much as you can on that subject. You will find your interest aroused, and you will be surprised at the number of applications you will soon find for your new knowledge. Study and reflection are necessary if you are to make progress in your work. Promotion seldom comes to those who fail to prepare for greater responsibility.

Set goals now that will permit you to realize some personal achievement and development in 1961.



A Safety Hint For Your Mechanics

A MECHANIC in a Toronto garage was working on a car when he cut the index finger of his left hand. It was not a big cut, and it bled very little. He went right on with his work.

He had to wash a few small parts in some cleaning fluid; when he finished he held them in his left hand to blow them dry with an air nozzle. Apparently the jet of air played over the small cut he had received earlier.

A short while later the mechanic, obviously in great pain, staggered to the shop manager and complained that his head and body felt as though they were going to explode. He was rushed to the

hospital where his condition was diagnosed as "air bubbles in the blood stream." There were even traces of the cleaning fluid in his blood.

Luckily the mechanic recovered in four days, but the doctor gave him a warning he will not soon forget.

Here's the doctor's warning.

"You could easily have died," he said, "from one or both of the dangerous elements in this situation: using an air hose on an open wound, and failing to get first aid for a minor cut."

—Excerpted from *Labor-Management Cooperation Service*, Industrial Relations Branch, Ottawa, Canada.



Bethlehem roof bolts clamp rock strata together to improve the safety in this coal mine.

Keeping the roof safe

The proved way to make your roof sound—and keep roof falls to a minimum—is to install bolts in the correct pattern for local conditions. This includes both stratified and massive rock formations.

Who figures this out? Who works right along side your team during the installation? Who checks back, at specified periods, to test and inspect? Your Bethlehem contact man. He'll come see you. Just tell us where and when.



for Strength

... Economy

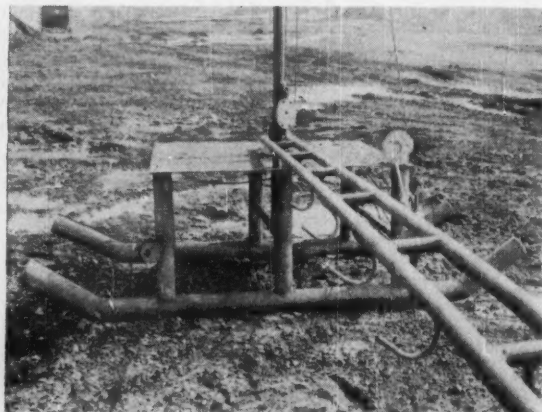
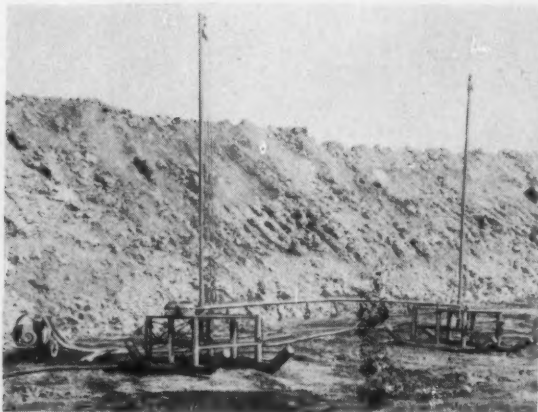
... Versatility

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Sales Bethlehem Steel Export Corporation

BETHLEHEM STEEL



Operating Ideas



Better Power-Cable Support Is Moved Easier

AN IMPROVED power-cable support, used to raise pit power cables above truck roads, not only is easier to move but also simplifies cable handling on the support. Installed at Banner mine, The United Electric Coal Cos., Banner, Ill., the cable support consists of two skid-mounted bases with upright members

and a movable cross member which is raised and lowered by two hand-operated rope, pulley and windlass arrangements.

When the cable support is not in use, the movable cross member rests on the two bases as shown in the two photographs above.

When the member is in this position, the unit has a lower center of gravity and is easier to move. Furthermore, a power cable needs to be lifted only about 2 ft and placed in the series of hooks welded to the member when a cable is to be raised above a haulage road.



Tips for Keeping Water Out of Diesel Fuel

ABRASIVE DIRT is the No. 1 enemy of precision, diesel fuel system parts, but water does not take too much of a back seat in this respect, according to the International Harvester Co., Chicago, Ill.

Fuel filters do an excellent job of collecting abrasive solids but, unfortunately, they are powerless against water. But since water is heavier than fuel oil, it can be separated from the fuel oil before it reaches the equipment fuel tank.

If a large, stationary storage tank is used, it is essential to make certain the tank is not designed for fuel withdrawal from

the bottom. A space of at least 3 in should be provided at the bottom for settling. Full advantage should be taken of this space by letting fuel settle for several hours after the tank is filled. This period will let the water and other impurities settle to the bottom. To keep contamination to a minimum, the bottom of the tank should be drained regularly.

If refueling is done from 55-gal drums stored outside, they should be kept in the horizontal position. This position prevents rain water or snow from collecting on top of the drums and eliminates condensation inside the drums.

Keeping water from collecting in stored fuel is only part of the battle, the next step is keeping it out of equipment fuel tanks. The important precaution here is to keep a full tank at night, when most condensation forms. A completely full tank has no room for condensation. It is also important to drain the bottom of the tank regularly.

A further safeguard is the water trap which is a built-in feature of many International fuel systems. This glass bowl device is located at a low point in the fuel system and lets the water settle. An extra-fine mesh screen also separates water from the fuel in motion, the greater strength of water causing it to collect on the screen and drop into the trap.

The water trap is effective only if it receives regular service. The petcock on top of the trap should be opened daily. Fuel pressure will force the water out, even if the engine is not running. Keep the outside of the bowl clean so that any water inside will be visible.

If a unit is not equipped with a water trap, then it is doubly important to drain water from the fuel tank daily. To prevent fuel waste, the drainings should be caught in a glass container which makes it easy to tell when all the water has been removed.

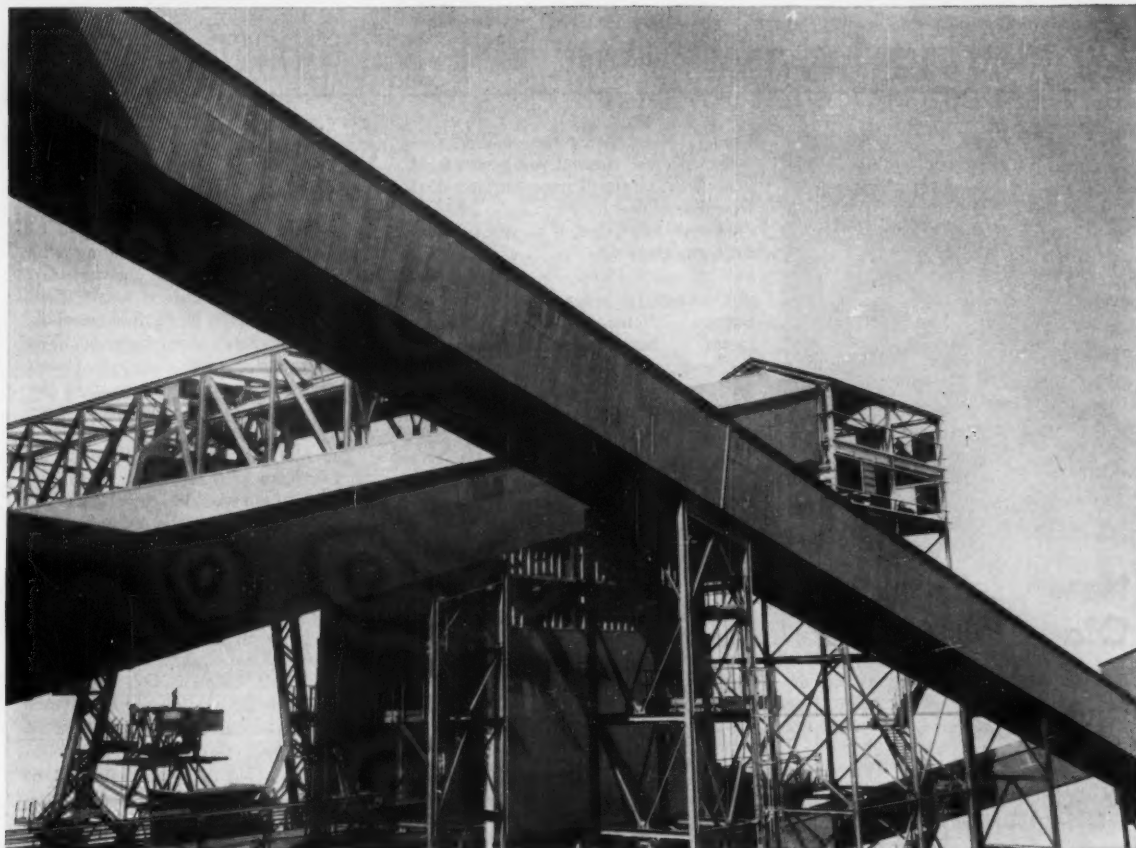
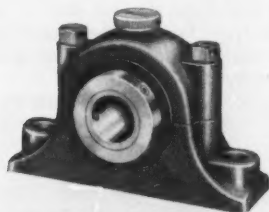


Photo courtesy of McDowell Co., Inc.

Dodge dependability built into sinter plant conveyor system at Inland Steel



**DODGE TAPER-LOCK
STEEL CONVEYOR PULLEYS**



**DODGE DOUBLE INTERLOCK
PILLOW BLOCKS
WITH TIMKEN BEARINGS**

Dodge Taper-Lock Steel Conveyor Pulleys and Dodge Double Interlock Pillow Blocks with Timken Tapered Roller Bearings contribute their dependability to this new sinter plant. They are an important part of the extensive conveyor system engineered by Dwight-Lloyd Division of McDowell Company, Inc., Cleveland.

Maximum strength with minimum weight is provided by these rugged conveyor pulleys. Their steel rims, discs and hubs are fused together into jointless drum construction for terrific impact resistance. With the unsurpassed holding power of Taper-Lock mounting there is no "walking on the shaft."

Dodge Double Interlock Pillow Blocks (with Timken Tapered Roller Bearings) were chosen for this hard service. They are rugged, compact, fully self-aligning—with substantial radial and thrust capacities. The extra long inner race distributes load over a greater shaft area. They are adjusted, lubricated and sealed at the factory—for a long life of dependable service.

DODGE MANUFACTURING CORPORATION, 3000 Union St., Mishawaka, Ind.

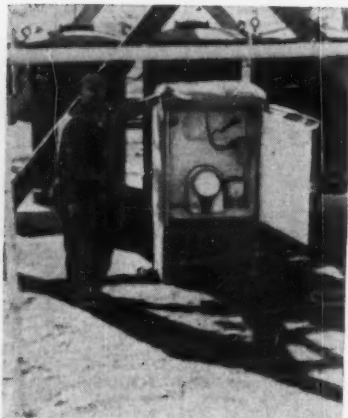
DODGE

→ of Mishawaka, Ind.

CALL THE TRANSMISSIONEER—your local Dodge Distributor. Factory trained by Dodge, he can give you valuable help on new, cost-saving methods. Look under "Dodge Transmissioneer" in the white pages of your telephone directory, or in the yellow pages under "Power Transmission Equipment."



Operating Ideas (Continued)



New Uses for Old Refrigerators

LOOK what is happening to old discarded refrigerators, writes L. A. Engstrom, engineer, Gunn Quealy Coal Co.,

Quealy, Wyo. After the motors, coils and extras are removed you have a light, dry, clean, insulated, movable and dust-free storage unit.

Master Mechanic Horace Middleton for Gunn Quealy has put several of these old refrigerators to use. He has been able to keep switches clean and easy to maintain. Meters and delicate instruments are kept clean and safe. Recording charts are kept clean and dry and with the use of a small light bulb the recording ink is kept from freezing.

The boxes are excellent for storing parts in an underground mine, Mr. Engstrom notes. They provide clean, safe storage for the numerous small fittings, valves, gages and testing equipment. And they are light enough to be easily moved as the working area advances.

Referred to as "Corky's Coolers," the boxes have been used to house telephones on working sites in open areas around construction. And the box provides an excellent place to store papers, drawings, blueprints and other miscellaneous items.

Cheaper Cutting With Natural Gas

A DEMONSTRATION of cutting with natural gas substituting for acetylene recently was given at Eastern Gas & Fuel Associates' Wharton No. 2 tippie, according to *The Safe Mine Foreman*. The demonstration proved that with torch equipment designed for this purpose the use of natural gas was practical, cheaper and safer than acetylene.

The fuel cost is said to be about 2c per hour compared to 77c for acetylene. Although there was less than 1 lb gas pressure on the line the cutting speed was about the same as for acetylene.

The demonstrators repeatedly and purposely snuffed out the flame against metal and severely damaged a cutting tip to prove that "backfires" were impossible with the equipment.

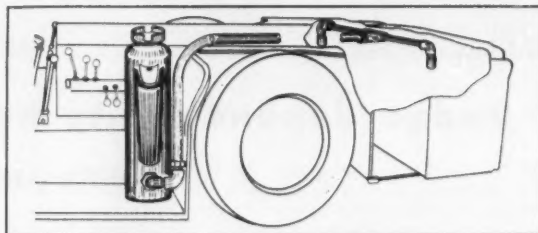
The Harris Calorific Co., Cleveland, Ohio, makes the equipment. The Wesco Corp., Charleston, W. Va., is distributor.

Built-in Fire Protection For Cutting Machines

A NEW SYSTEM of fire protection for coal cutting machines has been developed by the Semet-Solvay Div., Allied Chemical Corp. in an effort to provide greater fire safety for mine personnel as well as reduce possible fire damage to the machines. This new system will supplement Semet-Solvay's other fire protection facilities at the mines.

The new system, developed in cooperation with engineers of the Ansul Chemical Co., Marinette, Wisconsin, includes a 30-lb automatic piped system built into the trackless cutter. It is capable of expelling 30 lb of dry chemical into the unit's cablereel section as soon as fire breaks out. Semet-Solvay has about 30 such machines in its mines at Tralee and Harewood, W. Va.

With the new Ansul PS-30 system, the dry chemical extinguishing agent is expelled through pipes to a manifold sur-



rounding the back shield of the reel. The manifold is equipped with three nozzles spaced around the shield. If the operator discovers a fire, he can push a valve which results in flooding the reel compartment with dry chemical.

The first of the Ansul units was installed about a year ago. As each cutter is taken out of service for overhaul, the company installs the new fire extinguishing system.

Low-Cost Shuttle-Car Road Cleaning

A FEDERAL INSPECTOR observed during a recent inspection of a West Virginia mine that shuttle-car roadways were generally clean and orderly. He checked into the method used in cleaning the roadways and wrote the following description, which appeared in a recent issue of the *Safety Newsletter*, published by the National Safety Council, Chicago, Ill.

"In several active sections of the subject mine, small battery-powered Kersey cars are used for distributing supplies in the face areas and on other various jobs in the section that ordinarily would re-

quire the use of a regular coal-hauling shuttle car. The Pocahontas No. 4 bed, which ranges from 36 to 42 in in thickness is being mined. Mining in this low coal presents a bigger problem, with regard to maintaining clean shuttle-car roads, than mining in higher coal beds. To combat this condition, officials at this mine have designed and constructed small bulldozer blades which are mounted on the front of the Kersey cars.

These blades are about 12 in high and slightly wider than the car. They are made of lightweight material and are easy to remove if desired. On each side

of the blade, a rider shoe is attached which can be set at the desired height to prevent the blade from digging into the bottom rock when in use. Also, in the center of the blade and on the outby side, there is an adjustment screw which holds the blade in a raised position when not in use. At least once during each coal-producing shift, these roadways are cleaned with this equipment. The cleaning is generally done after the coal face has been undercut or blasted for loading. Officials stated that the cost of road cleaning by this method is minor as compared to other methods used."

Alcoa Aluminum provides 15% payload increase in Marion Dump Trailers

Meyer Coal & Material Company, of Des Plaines, Ill., has over the past 18 months put into service seven frameless dump trailers built of Alcoa® Aluminum like the one shown below. They're used to haul aggregate from a gravel pit at Algonquin, Ill., to ready-mix plants located at Des Plaines and Wheeling, Ill. According to Bernard "Ben" Meyer, head of the company, "I am happy to say they've been a very satisfactory investment.

"Due to the lighter weight of the aluminum trailers, we have been able to increase our payloads more than 15 per cent over those of the steel trailers we formerly operated, with the same gross weight. Actually, six tractors and trailers now do the work in the same number of hours per day that formerly took seven units, and maintenance costs per unit are approximately the same. The additional original cost and the resultant increased depreciation are quickly overcome due to the increased payload capacity."

And Mr. Meyer, who has been in the business for 35 years, goes on to say, "We intend to add to our fleet of tractor-trailer units very shortly, and we will definitely buy aluminum trailers."

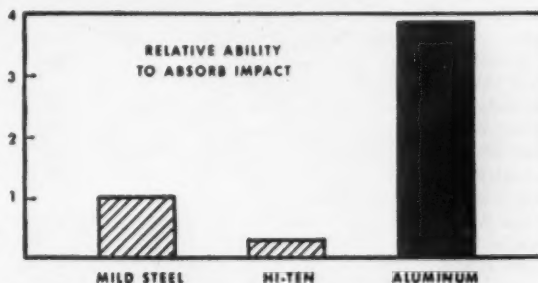
Marion Metal Products Company, of Marion, Ohio, built these lightweight trailers of high-strength,

weldable Alcoa Aluminum alloys and sold them to Mr. Meyer's company through General Body Sales Corporation, Marion's Chicago distributor. Designated Marion FDT-170 aluminum frameless dump trailers, the 22-ft units have a 17- to 20-cu-yd capacity and use a Marion 714T-156 telescopic hoist. They provide a payload increase of two tons within the laws of Illinois.

Why not investigate the profit possibilities which dump bodies and trailers of Alcoa Aluminum can bring to your own operations? For the names of other haulers who are enjoying benefits like those outlined above and your free copies of Alcoa literature on the advantages of aluminum in dump bodies, just write: Aluminum Company of America, 1776-M, Alcoa Building, Pittsburgh 19, Pa.

Proof: Aluminum is tougher than steel!

Dump bodies built of Alcoa Aluminum alloys can take three times the impact of steel—at half the weight!



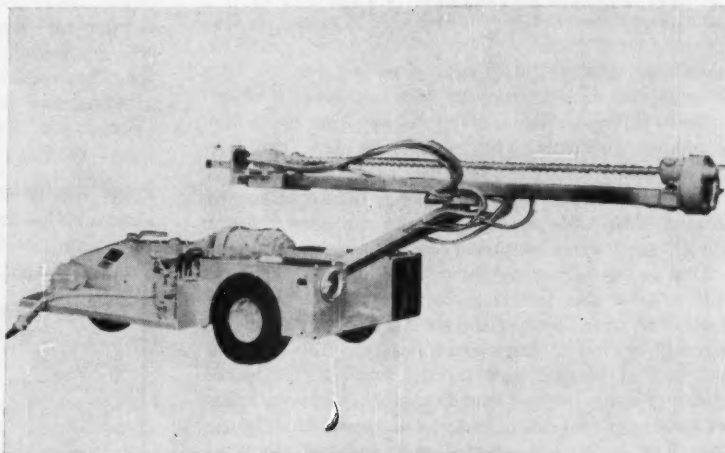
ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA



Equipment Developments

Efficient Drilling in Thinner Seams

Advantages of mobile coal drilling for coal seams as low as 28 in are provided by the TDF-10 mobile coal drilling machine introduced by Long-Airdox Co., Oak Hill, W. Va. This new machine features a new drilling concept known as "Rotary Thrust" where thrust is applied to the auger within one foot of the working face. The combination of thrust and ball bearing guides in the drill head permits faster, surer drilling and eliminates problems encountered when drilling thrust is applied at the auger shank, states the company. Extensive field service trials show that the TDF-10 can reduce mining costs since one man normally is able to perform both drilling and shooting operations. This savings in production costs results from the machine's ability to drill holes 9-ft deep in 12 to 15 sec. Shooting and loadability are improved since the machine can drill holes parallel to the roof and only 2½ in from it. An advantage to thin seam mine operators is that the TDF-10 can drill over dust piles that remain after cutting. The machine's mobility and high speed drilling features will enable



more thin seam mine operators to realize the advantages of multiple Airdox shooting techniques. In this system, a development of Long-Airdox Co., a series of reusable tubes are inserted in drilled holes and shot in sequence. Coal broken by this nonexplosive method is easier to load and clean. Variable drilling speeds are provided for all types of material with the operator controlling the auger feed rate of 0 to 33 fpm by a foot throttle. The TDF-10 is a 2-wheel drive, manually steered machine. Its

narrow width of 55¼ in permits considerable maneuverability in confined working places. Each driven wheel of the machine is powered separately by a hydraulic motor operating through a speed reducer. Tramping speed is 0 to 150 fpm. Functions of tramping, boom lift, and drilling are hydraulically powered, with steering being a manual operation for maximum simplicity. Fingertip controls are provided for all hydraulically-powered functions. Vertical drilling range is 18 in to 5 ft.

Motorized Wheel Drive

Repowering off-highway vehicles with electric drive has been made practical by using the newly developed small version of the motorized wheel, according to General Electric Co., Schenectady, N. Y. Owners of vehicles with rims in the 29- to 33-in range can now take advantage of an electric drive system, company officials state. Because motorized wheel drive utilizing traction motors mounted in the rims of the wheel eliminates the need for transmissions, axles and differentials, vehicles repowered with motorized wheels can be expected to operate 150,000 mi between drive overhauls. Through the dynamic braking system, the energy of the vehicle's motion is converted into electrical energy by the wheel motors acting as generators. The electrical energy is then dissipated as heat to bring the vehicle to a stop. Aircraft type disc



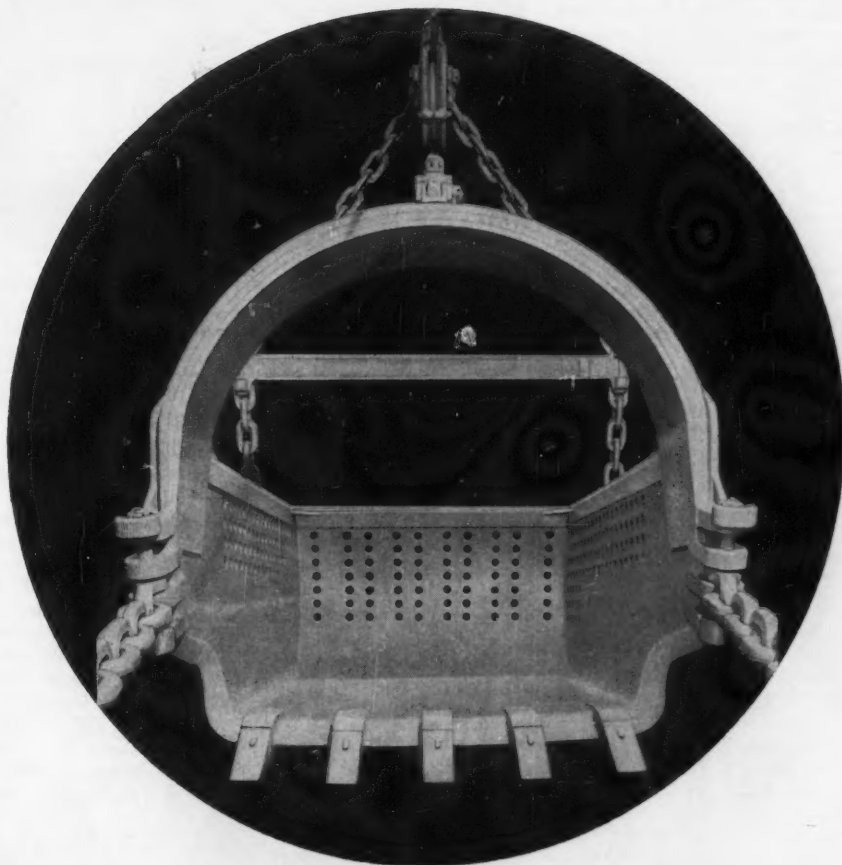
brakes are used only for emergency braking and spotting.

Motor Control Centers

Redesigned motor control centers, (left) with bus ratings from 600 to 1,600 amp and voltage ratings from 110 to 600 V, are offered by Allis-Chalmers Mfg. Co., Milwaukee, Wis. Horizontal buswork can be installed at top or bottom of the 20x20-in motor control centers and vertical buswork is braced for 50,000 rms compared with the former 25,000 rms. Made of nonbreakable, glassfilled polyester, the six vertical bus supports are curve molded to eliminate "short-causing" dust catchers. The aluminum bus is about 35 lb lighter than copper. Vertical wiring troughs have been expanded in area from 27 to 30 sq in and conduit openings are 14x14 in. Among other features are split covers, standard plug-in terminal block, reverse action springs, pushbuttons located on the pan with pilot lights and new lock-out, tilt-out pan.

HENDRIX

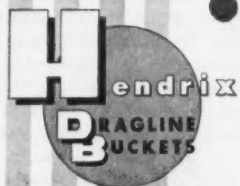
Heavy Duty Mining Buckets



HIGHER ARCH · WIDER FRONT · TAPERED BASKET · GREATER STRENGTH

- LESS DOWN-TIME
- MORE PRODUCTION
- LESS MAINTENANCE
- LOWER COST-PER-TON

4½ to 14 Cubic Yards With or Without Perforations



HENDRIX MANUFACTURING CO., Inc.
MANSFIELD, LOUISIANA

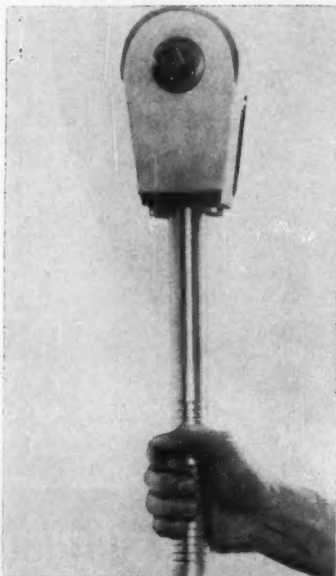
Shuttle Car Without Clutches

Capacity, power and structural strength are features of the new, big AC shuttle car offered by the Goodman Mfg. Co., Chicago, Ill. With a basic height of 44 or 49 in and a width of 96 or 106 in, the car is easily capable of transporting 10 tons of coal, a payload that can be increased with the addition of 6- or 12-in sideboards. An 80-hp traction motor with two sets of windings provides for 2-speed operation (2½ or 5 mph) without the use of clutches and torque converter, and also permits the use of simple electrical, mechanical and hydraulic systems. A 26-hp motor powers a mechanical conveyor drive and the hydraulic system. Both motors are Goodman built and rated 75 C rise at full



load. Planetary-type wheel units lessen wear and strain on the entire tram mechanism and produce high torque at the wheel hub where it is needed for

heavy duty service. An all welded body and reinforced frame withstand rugged usage. A ground clearance of 11½ in is of definite advantage on soft bottom.



Manual Impact Wrench

A new "Swench" wrench, completely self contained and hand-operated, is being manufactured by Curtiss-Wright Corp., Marquette Div., Cleveland, Ohio. The ratchet-type impact wrench which enables an individual to handle the toughest bolting jobs with ease and safety, can be used for applying force to loosen a frozen nut or for tightening a bolt to desired tension with greatly reduced manual effort, according to the

manufacturer. Requiring no power supply or auxiliary equipment, the wrench increases the range of bolt sizes which can be handled. First of its kind, the wrench uses automatically delivered spring-actuated rotary-hammer blows or impacts to produce tremendous magnification of the torsional force manually applied to the handle. This impact principle also gives the user precise control of the magnified force delivered to a nut or bolt. Swench is now being produced in ¾-, 1- and 1½-in drives.



Idler Sleeve Cleans Belts

Designed to increase flexing of conveyor belts to remove accumulations on return flights, the new Sta-Kleen Dubl-Tread idler sleeve, made by Goodyear

Tire & Rubber Co., Akron, Ohio, is fabricated to the same diameter as idler rolls for ease of application and long life. Using two treads rather than the single tread, the sleeves flex the belt evenly as it passes over the idler rollers, thereby causing the caked accumulation from the belt surface to separate and flake off the belt. Principal advantage of the new sleeve is its ability to flex the belt surface into twice as many sections as a single tread. Fabricated of 2-ply duck foundation with treads built up to ½-, ¾- or 1-in wall thickness, each sleeve has a channel between the two treads to receive a band that anchors the sleeve to the idler.

7-Strand Wire Rope

A completely all-new all-purpose wire rope named "7-Flex" has been designed and is being manufactured by Macwhyte Wire Rope Co., Kenosha, Wis. Basic difference between this new wire rope and all ropes previously manufactured, according to Macwhyte, is its 7-strand construction. Said to combine the best features of the conventional 6- and 8-strand wire rope, it has an independent wire-rope core. The extra flexibility and greater compactness of the seven strands, plus 16% more wearing surface than 6-strand rope, as shown by exhaustive trials, has given surprising service, Macwhyte notes in stating that the rope is "all new." Sizes available are ½ to 1½ in. New sizes will be added as further needs arise.



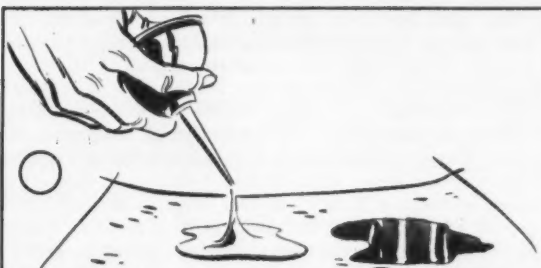
DISTRIBUTOR DAN, the SKF bearing man, offers FIVE TIPS ON BEARING LUBRICATION —that can save time and trouble for you



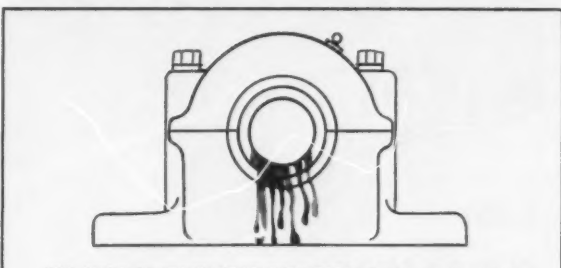
WHEN TO RE-LUBRICATE? Always follow the manufacturer's directions, if they're available. Most bearings, whether oil- or grease-lubricated, need cleaning and re-lubrication once a year. Re-lubricate oftener if the bearing is large, operates at high speeds or temperatures of 120-140 F. or higher.



WHAT GREASE CAN TELL YOU. Grease itself can tell you when cleaning and re-lubrication are needed. Dark grease means that oxidation has started or that abraded particles are present. Changes in the original color indicate water. Grease of a hard consistency should always be replaced.



WHEN TO CHANGE OIL. Compare the oil in the bearing with unused oil. Clouded oil indicates water. Dark oil frequently indicates sediment. Dark, pitch-like coatings on the rings, roller ends or cage mean the oil has become dirty or begun to carbonize. So, clean the bearing and housing and re-lubricate.



TOO MUCH IS WORSE THAN TOO LITTLE. Don't overlubricate. Only grease that actually contacts the bearing lubricates. Using too much grease may cause churning and lead to overheating and loss of lubricant. Remember: the higher the speed, the more sensitive a bearing becomes to excessive lubrication.



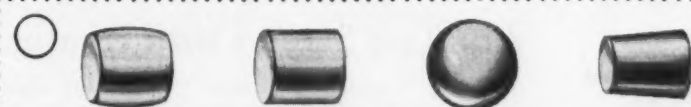
CLEANLINESS, FIRST AND LAST. Clean new oils and greases will usually force-out old lubricants in the bearings. But they won't if the lubricant is badly oxidized. Pour a hot aqueous emulsion into the housing. Rotate shaft until bearing is clean. Drain solution while rotating shaft. Then, flush with hot light oil, drain and add new lubricant.

Baffled by a bearing problem? Whether it's selection, mounting, or maintenance—consult your Authorized SKF Distributor. He's staffed to help you keep them running smoothly and he stocks all the bearing types and sizes you need.

SKF

AUTHORIZED DISTRIBUTOR

6019



Spherical, Cylindrical, Ball, *Tapered* and REED Miniature Bearings

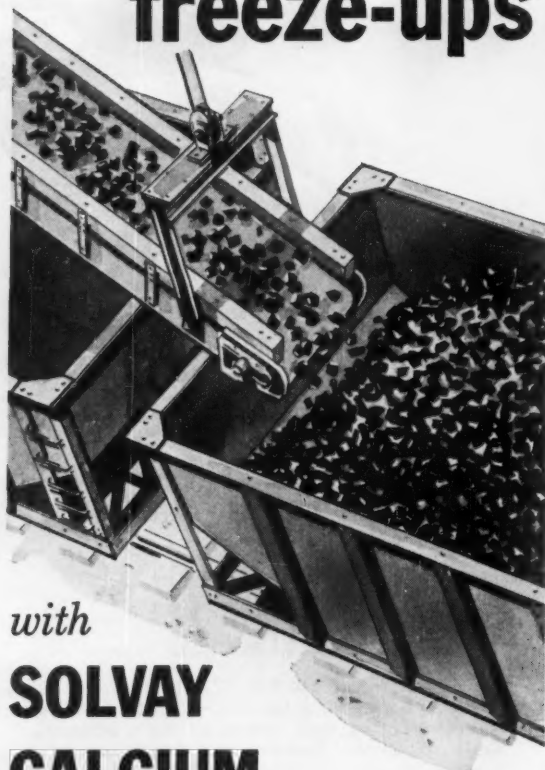
EVERY TYPE—EVERY USE

SKF

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with

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- ② Use it to stop needless accidents. Solvay Calcium Chloride used with abrasives skidproofs icy haulage roads ... melts ice at all temperatures, even down to below zero. It's easy and economical to spread with simple equipment.

For further details, write Solvay for "mine and quarry freezeproof data."



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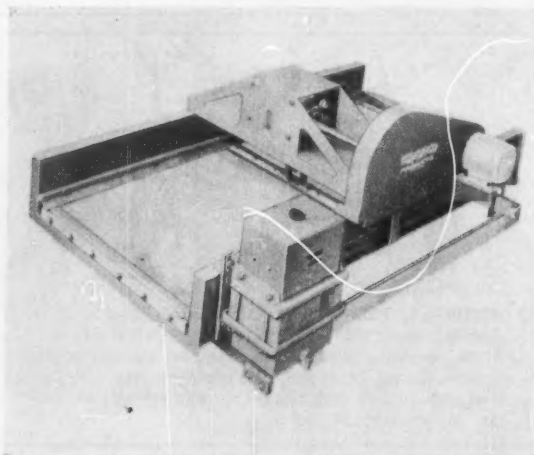
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Detroit • Houston • New Orleans • New York • Philadelphia • Pittsburgh
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Equipment Developments (Continued)



Roof Support

Yieldable steel arches, designed to resist extensive ground pressures in mining operations where openings are maintained within fixed limits, are available from Commercial Shearing and Stamping Co., Youngstown, Ohio. Manufactured to specifications of the original Toussaint-Heintzmann (T-H) underground yieldable steel support, they are formed from U-shaped steel sections and fabricated to specific patterns. Ends of the segments overlap and are securely clamped together at the joint. Offered in seven sizes from 3 to 7 in wide, an exclusive feature of the arches is the friction contact area, confined to specially designed flanges and side webs, which reportedly provide efficient, trouble-free yielding. As a result no friction exists between horizontal webs, thereby eliminating buckling under excessive pressure. Segments require small storage space, are easily handled and assembled, and can be quickly and economically installed, according to the company.



Vibrating Screen with Heater

"No Blind" is the name given to the Model E Leahy vibrating screen with FlexElex heater made by Deister Concentrator Co., Inc., Fort Wayne, Ind. Differential motion of the screen clears meshes of intermediate size wedging particles. The Flex-Elex heater is said to keep the screen wires warm and dry for

MANAGEMENT HAS A STAKE IN MAINTENANCE

... because it can radically affect the tons-per-man rate

Nobody needs to be told—least of all management—that the coal industry is looking for new ways to boost the tons-per-man rate. That's why forward-looking operators are beginning to take a closer look at the maintenance practices in their mines.

Maintenance today is an exact science. And the rewards of treating it as such can pay off in a drop in maintenance costs—often as much as 15 per cent.

The major pay-off, however, is in raised production rates—in other words, in more tons per man-hour.

An efficient maintenance program pays immediate dividends with virtually no capital investment.

The reasons are fairly basic: In the vast majority of mines, maintenance practices have not kept pace with the rapid mechanization of mine operations. And neglect of proper maintenance will inevitably exact a toll in excessive downtime, wasted lubricants and idle men—all factors affecting the cost of producing coal.

Chief electricians and master mechanics are doing their best to combat the problem, but they need management's support—and management realization that the problem exists.

For example: A machine that's overloaded will develop more power, dig more coal. *But* it will go to

the shop a lot faster, too—overloaded bearings will fail, seals will give way, and the machine is down.

Management men who have investigated this problem, have found that optimum production on a long-term basis can only be achieved by eliminating those practices designed to provide a short-term gain.

This means a planned maintenance program operating on a year-round basis.

TEXACO CAN HELP YOU SET UP A PLANNED MAINTENANCE PROGRAM

Lubricants are important in keeping equipment operating efficiently. Not only the choice of the lubricant itself, but also its storage, handling and application can affect equipment life. For this reason Texaco has made an exhaustive study of mine maintenance problems. We would be glad to help you set up a planned maintenance program or discuss any phase of it with you. Just call the nearest of the more than 2300 Texaco Distributing Plants or write to Texaco Inc., 135 East 42nd Street, New York 17, N. Y.

Tune In: Texaco Huntley-Brinkley Report, Mon. Through Fri.-NBC-TV



LUBRICATION IS A MAJOR FACTOR IN COST CONTROL
(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

Equipment Developments (Continued)

uninterrupted high production, possible only with complete elimination of blinding from any cause. Characteristics include new jacket assembly and mounting concept, simplified jacket tensioning adjustment, easy and quick mounting and demounting of jackets, and no electrical connections to unmake and remake when changing jackets. Among other features are short, direct and out-of-the-way bus bar runs from heating transformer to contact bars at jackets and elimination of flexible cables or connections in the heating circuit.



Off-Highway Haulers

With the addition of two end dump models, the Haulpak line of LeTourneau-Westinghouse Co., Peoria, Ill., now covers the entire size range for off-highway haulers. Weighing 33 tons, Model 60, shown here, is said to be capable of hauling a payload almost twice its own weight. It is powered with a 550-hp Cummins, V-12 Model VT12-700 turbocharged diesel engine and Allison CLBT-5940 Torqmatic transmission with six forward speeds and top speed of 46.6 mph. Model 42, powered with a 430-hp Cummins, V-8, Model VT8-430 turbocharged engine and the 6-speed Allison CLBT-5940 transmission, is capable of a top speed of 47.7 mph. Unusual features reported include elimination of "automotive-type" assemblies or replacement with tougher "earthmover-type" components, replacement of conventional axles and springs with the exclusive "Hydrair" suspension system using four big pistons as giant shock absorbers, and short 160-in wheel base. The entire steering system, protected above or within the frame, affords almost twice the ground clearance of conventional vehicles. Use of the Hydrair system and box-beam frame allowed design of a better loading, clean dumping body—with at least 10% of the load being carried below the normal floor line of this deep V-body—thus lowering the center of gravity and improving stability. To keep wet, cold material from sticking to the surface of the body, heat is provided by hot exhaust gases circulating around the body through hollow box-section supports, with outlets in the extreme rear, away from the operator.



Liquid Shim

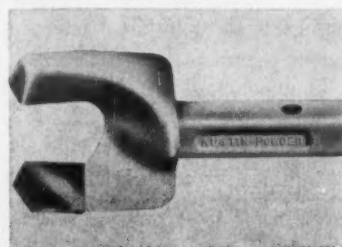
"Loctite," a product of the American Sealants Co., Hartford, Conn., is reported to restore the fit between replacement bearings and worn housing in electric motor end-bells. The new plastic sealant acts as a "liquid shim" between bearings and worn end-bell housings. It is applied in liquid form and then hardens to give a perfect fit, according to the manufacturer. It will generally take less than 2¢ worth of Loctite to replace expensive sleeving or costly end-bell replacement. The complete repair can be made in any maintenance shop in less than 15 min.

New Service

A new service now offered to diesel engine owners by distributors and dealers of the Detroit Diesel Engine Div. of General Motors Corp., Detroit, Mich., provides written assurance that all overhauls they perform conform to the high standards set by the division. In addition the service certifies the results attained as indicated by dynamometer test. Two new forms are completed and delivered to the customer. An "Engine Test Report" indicates all pre-start and run-in checks made, duration of basic run-in periods at various engine speeds and loads, adjustments required after both the basic run-in and final inspection, and engine characteristics as revealed by the final dynamometer test. The "Dynamometer Test Certificate" confirms the overhaul, tests and inspections made and enables the engine owner to determine the number of hours worked or miles traveled between overhauls.

DENSITY MEASUREMENT—A continuous, in-process specific gravity measuring system, designed for use with liquids, solutions, slurries and suspensions, has been developed by Weighing and Controls, Inc., Hatboro, Pa. Operating without radioactive devices or complex mechanical transducers, its output signals can be used for indication, record-

ing or control purposes. A flexure-mounted pneumatic weight transmitter, coupled with a specially designed stainless steel tank, continuously weighs a constant volume of a slurry or liquid, and since the weight of the constant volume is directly proportional to the specific gravity of the material, readout is directly in specific gravity units. Volume is kept constant by one of two methods. If the material contains air, a probe and air vent valve maintain the liquid level by venting the top of the tank, permitting a closed pressurized system. Liquids not containing entrained or dissolved air can be measured in a simpler, open-top, overflow tank. In both, turbulence can be introduced by baffles so contained materials remain in suspension. Attaching a motor mixer to the tank for agitation is also practical, according to the company.



DRILL BITS—Two rotary drill bits, known as Austin D and DV Styles, have



We torture our plastic pipe more than you ever will

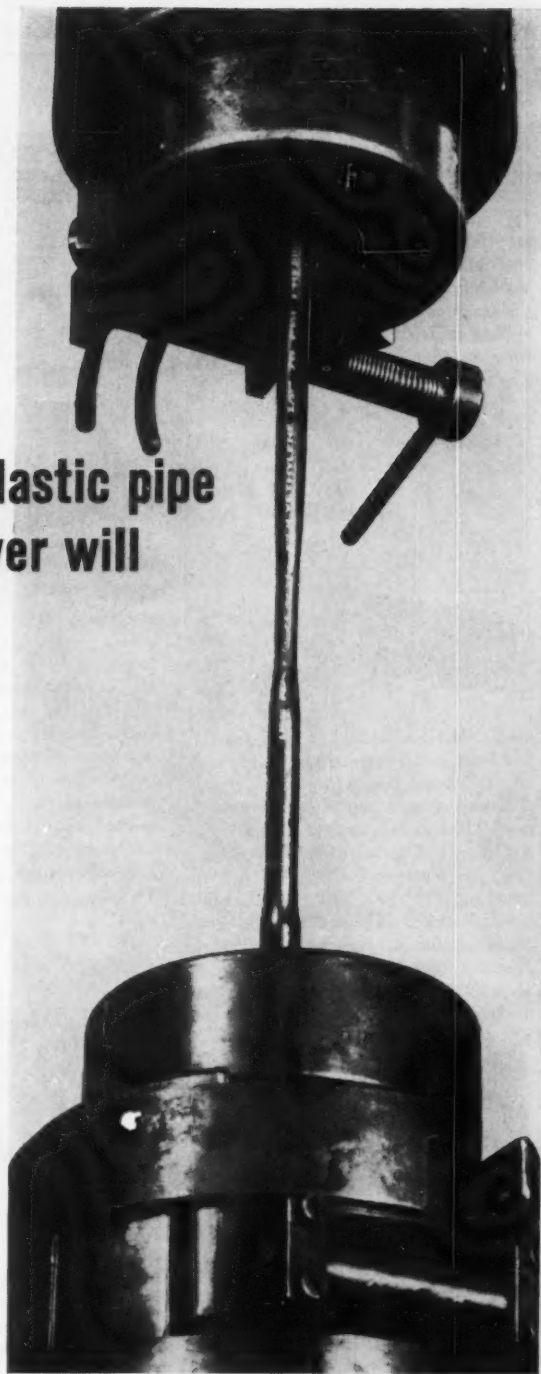
We stretch USS National Polyethylene Pipe to find its breaking point. This is just one of the ways our Research Laboratory measures plastic pipe performance. Test conditions are far more severe than those found in normal use.

A length of USS National Polyethylene Pipe is stretched by the tension machine until it shatters. Pulling forces are much greater than specification. This and other tests show that our plastic pipe has strength to spare for mine drainage applications.

USS National Polyethylene Pipe is unaffected by exposure to corrosive mine water, many acids, alkalis, salts and other mine chemicals. National Polyethylene Pipe performs from -90 F. to +120 F., and it won't crack or break in sub-zero weather.

You can get USS National Polyethylene Pipe from ½" to 6" diameter in a variety of wall thicknesses. It's light, flexible and easy to handle, and thus reduces installation costs. For detailed information, write National Tube Division, United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

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Watch United States Steel's special Christmas show, *The Coming of Christ*, in Color on NBC-TV, Wednesday, December 21, 8:30 P.M., E.S.T.

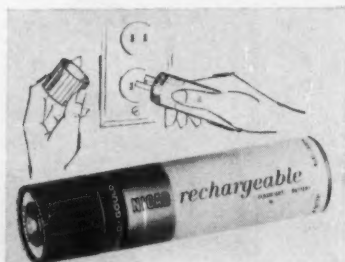


**National Tube
Division of
United States Steel**

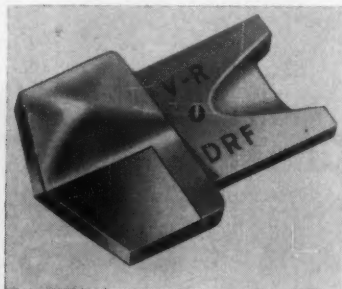
Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
United States Steel Export Company, New York

Equipment Developments (Continued)

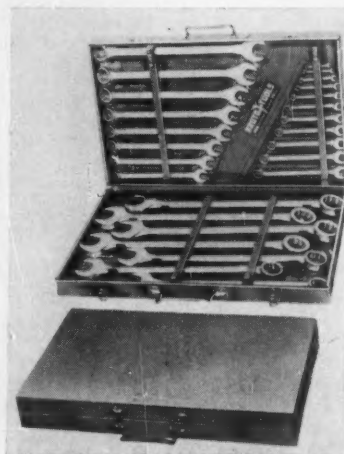
been announced by Austin Powder Co., Cleveland 13, Ohio. D style, recommended for all general drill work, may be reground more frequently than ordinary bits. DV style, because of its "V" design, offers fastest penetration rate with least pressure in noncoring coal. Made with oversized carbides multibonded in special alloy steel shanks, the combination, reputed to provide full cutting faces while protecting bits from wear and damage, are available in 1¼-, 1½- and 2-in hole diameter sizes.



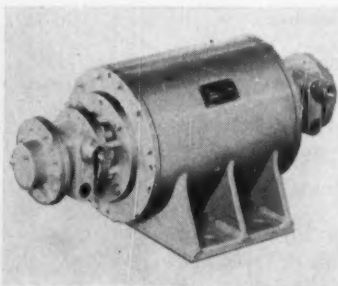
CARTRIDGE—"Nicaid," a rechargeable flashlight battery cartridge made to fit all "D" 2-cell flashlights, has a removable cap which permits recharging in any 110-V, AC outlet. Hermetically sealed and of nickel cadmium construction, the batteries recharge to full capacity in 14 hr. The manufacturer, Gould-National Batteries Inc., St. Paul, Minn., claims a minimum of 250 recharging cycles and that each charge gives 50% more continuous light than the average flashlight battery.



BITS—Style DRF roof drill bits, especially designed for use on Fletcher roof bolting machines equipped with internal dust collectors, provide cooler, smoother drilling all the way in the hole and lessens chance of the bit burning up, as reported by Vascoloy-Ramet Corp., Waukegan, Ill. Among advantages noted are faster penetration in all types of rock, reduced power consumption up to 75% and minimized fines pulled off faster.



WRENCHES—Containing a complete size range of combination wrenches designed for heavy industry, Proto Set No. 1200-A consists of 26 wrenches plated with heavy chrome, with openings from ¼ to 2 in. The slim wrench heads are designed for clearance with maximum strength. Each wrench, forged in Protoloy alloy steel, is locked into position in the heavy-duty steel box of welded construction. Twin handles on the box may be padlocked together. Full information is available from Proto Tool Co., Los Angeles, Calif.



VIBRATOR—Martin Engineering Co., Neponset, Ill., is offering the "Vibrolator" DVP-24,000. Weighing 231 lb, the new vibrator will develop 12 tons of unbalanced force at 3,000 rpm. The unbalanced force is generated by a novel lead-shot loading allowing simple power adjustments by removing or adding shot to the eccentric weight. A choice of pneumatic or hydraulic drives is offered. Frequency may be steplessly controlled from 0 to 3,000 vpm by regulating the flow of air or oil. Reported to have a low noise level and operate in any position, the DVP must be fastened securely to the heaviest of structural members to be effective.



ROOF BIT—The FDC roof bit, redesigned to take full advantage of increasingly powerful rotary and rotary percussive roof drills, has been announced by Kennametal Inc., Mining Tool Div., Bedford, Pa. A substantial increase in the seating surface between bit base and drill steel chuck distributes drilling forces over a larger area which is reported to be particularly advantageous where high thrust or rotary percussive-type drills increase impact loads and rate of wear. The more rigid support of a square shank with cross-sectional area increased by removal of water grooves, also eliminated bit wobble and lengthens drill steel life. New shape of the bit forging affords freer flow of cuttings from the hole and guides cuttings away from the shank and chuck where packing would reduce drilling efficiency. Five sizes for 1½- to 1¾-in holes are available.

Equipment Shorts

Axle Shafts—Use of induction hardened axle shafts as a standard component has been extended to cover all International trucks with full-floating rear axles from 4,200 to 30,000 lb gw. The induction hardening method of applying exceptionally high heat to outer surfaces creates excellent torsional characteristics with an extremely hard outer layer while retaining a tough and resilient inner core, according to International Harvester Co., Chicago, Ill. This process is also reported to reduce shaft vulnerability to spline-end breakage.

Drilling—The "Minuteman" portable drill, announced by Mobile Drilling, Inc., Indianapolis, Ind., is a compact, multi-purpose, rotary unit designed for subsurface exploration and production drilling. It handles continuous flight augers from 3 to 12 in in diameter and drives 6-in-dia augers to 30-ft depths. When equipped for core drilling, it drives "EW" core barrels to 200 ft. Weighing 150 lb, the Minuteman features a 6-hp engine, 8-speed automotive transmission, diaphragm-type carburetor,



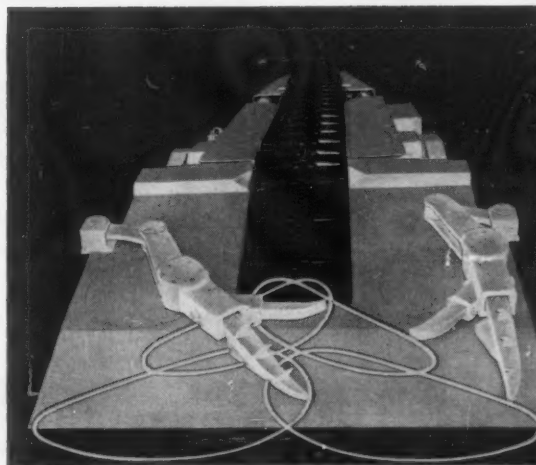
NEW DOUBLE-ARM GATHERING DESIGN MULTIPLIES LOADING EFFICIENCY

No other loading machine even approaches the new LONG-AIRDOX 188-3 in overall performance, economy, and versatility. One reason is the 188-3's exclusive reverse link, double-arm design.

This new concept in loader construction offers these important benefits: shorter, more powerful strokes (with 30% more torque per stroke); faster, more positive gathering; less scattering of material; higher tonnages; greater efficiency.

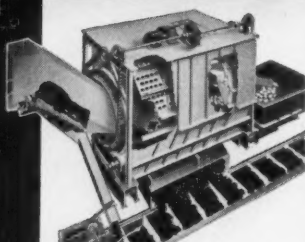
Other advantages provided by the 188-3 include: savings on maintenance and parts inventory resulting from the simplified single motor design, better maneuverability due to independent crawler control, flatter head angle, and unusually good balance.

Available in heights 23½" and up, with capacities to 12 tpm, 188-3 loading machines are applicable to all popular mining systems. For details or a demonstration, write Long-Airdox Company, Division of Marmon-Herrington Company, Inc., Oak Hill, W. Va.



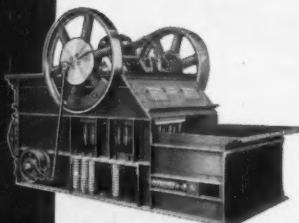
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America's most complete line of CRUSHING EQUIPMENT



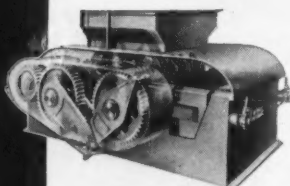
**McNally Pittsburgh
Rotary Breaker**

This unit allows positive control of top size in handling run-of-mine washery feed. Production of fines is held to a minimum.



**McNally Norton Vertical
Pick Breaker**

50% less fines when reducing lump to egg and stove sizes.



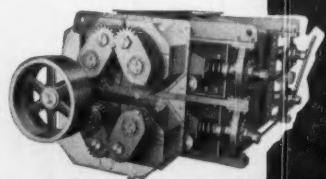
**McNally Double Roll
Gearmatic ROM Breaker**

Built in tonnage ranges from 750 tph to 1400 tph. Full floating gearmatic drive.



**McNally Gearmatic Stoker
Coal Crusher**

This unit offers three prime advantages: high volume production, plus accurate sizing, plus low percentage of fines.



McNally Two Stage Crusher

This unit consists of a double roll primary crusher mounted above a double roll secondary crusher—compactly arranged into a single rigid structure.

Available From Stock and on Short Delivery
For immediate action on complete information write,
wire, or call

McNALLY PITTSBURG MFG. CORP.

Pittsburg, Kansas

Wellston, Ohio

Equipment Developments

wheel-mounted base and 2-point anchoring.

Arc Welding—Lincoln Electric Co., Cleveland, Ohio, offers a complete line of new 3-phase rectifier DC arc welders. The "Idealarc R3M" series, designed to NEMA industrial standards of 40 V, 60% duty cycle, incorporates silicon rectifiers to produce DC output in four sizes; 300, 400, 500 and 650.

Motor Oil—"McCulloch," a new 2-cycle motor oil, incorporating a formula of non-ash-forming detergents compounded especially for 2-cycle engines, has been placed on the market by McCulloch Corp., Los Angeles, Calif. The detergents are said to effectively reduce formation of ash deposits to the point where the oil can actually be claimed to clean the engine as it runs.

Batteries—Exide Industrial Div., Electric Storage Battery Co., Philadelphia, Pa., has added nickel-cadmium batteries to its line of industrial storage batteries. The new line is available in 22 electrical sizes, with 8-hr capacity ratings from 10 to 450 amp-hr and in other special types and sizes.

Trucks—Two heavy-duty all-wheel-drive trucks have been introduced by International Harvester Co., Chicago, Ill. Incorporating many new design features and improvements, the trucks are Model R-210 (4x4) rated at 39,000-lb gvw and Model RF-210 (6x6) with 49,000-lb gvw rating. With optional front axles, gvw ratings of 42,000 and 52,000 lb, respectively, are available.

Bin Vibrator—A magnetic bin vibrator, known as Model 70U, is made by Eriez Mfg. Co., Erie, Pa. Secret of the new unit's ability to regulate and maintain a

steady flow of materials, eliminating stick or bridging in the bin, is the double-impact system in which the vibrator's hammer strikes an anvil at both top and bottom of the stroke at 60 cycles per sec. Semi-resilient impact elements have the effect of cushioning the impact sufficiently to result in semi-noiseless operation despite the powerful vibratory action being exerted on the bin wall.

Lubricant—Keystone Lubricating Co., Philadelphia, Pa., offers its "No. 88 X Light" multi-purpose lubricant in 14-oz cartridges for use in any lever-type gun made for cartridge grease. Especially suitable for plain and antifriction bearings and for use on rotating or sliding surfaces, it is said to withstand shock loads, seal out dirt and lengthen bearing life.

Rock Reducing—"Pulvo-Matic," a new type of rock reducer, will crush coal to lumps of specified sizes. Aggregate sizes are accurately controlled and not affected by the wear and tear of hammers, jaws, etc. Only three models cover a full range of capacities from 10 to 250 tons of aggregate per hr. Full details from the Frog, Switch and Mfg. Co., Carlisle, Pa.

Diesel Engine—Allis-Chalmers Mfg. Co., Milwaukee, Wis. is now making available as a commercial engine its D-262 diesel engine which has been time tested as the regular supply of power for its Model DD motor grader, and the TL-10D and TL-12D rubber-tired, front-end tractor loaders. The basic D-262 diesel develops 77 hp at 2,200 rpm. Having a 3 $\frac{3}{16}$ x4 $\frac{3}{8}$ bore and stroke and a 262 cu in piston displacement, the new engine features replaceable "wet" type cylinder sleeves and full pressure lubrication, together with efficient air and oil filtering systems. It has a 12-V electric starting system. Available are the normal amount of accessories that adapt the engine to a wide range of applications. Open power unit consists of the engine assembly, radiator and engine support, exhaust pipe and clutch power takeoff, with the closed power unit also including sheet metal hood and rear panel housing.

Surveying—A self-aligning level, one in a line of surveying instruments manufactured by Cooke, Troughton & Simms, Ltd., York, England, is available from Charles Bruning Co., Mt. Prospect, Ill., exclusive U. S. distributor for the line. In this device the main spirit level vial is replaced by a compensating unit which keeps the line of sight in a horizontal plane. It is necessary only to level the instrument approximately by means of a circular spirit vial. Then the moving part of the compensator swings free and



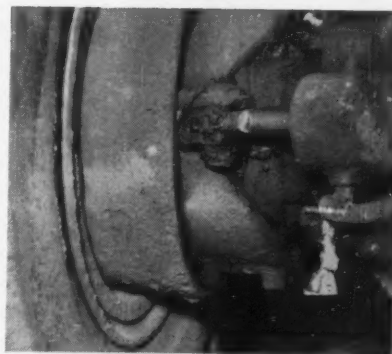
Hi-Torque brakes make underground hauling safer; hold 44 tons on 20% grades

This shuttle car is one of several KW-Dart vehicles in use at the White Pine Copper Company mine at White Pine, Michigan. The cars are equipped with B.F. Goodrich Hi-Torque brakes, designed for heavyweight off-the-road vehicles.

Each car weighs 44 tons fully loaded with copper ore. White Pine reports the ability of Hi-Torque brakes to handle such heavy loads safely is an outstanding advantage. With full loads, the vehicles hold on steep grades encountered in the mine, ranging up to 20 percent.

The cars are being used on a round-the-clock basis, 7 days a week, with brakes applied most of the time the vehicles are moving. Yet in several months of operation no maintenance or replacements have been required.

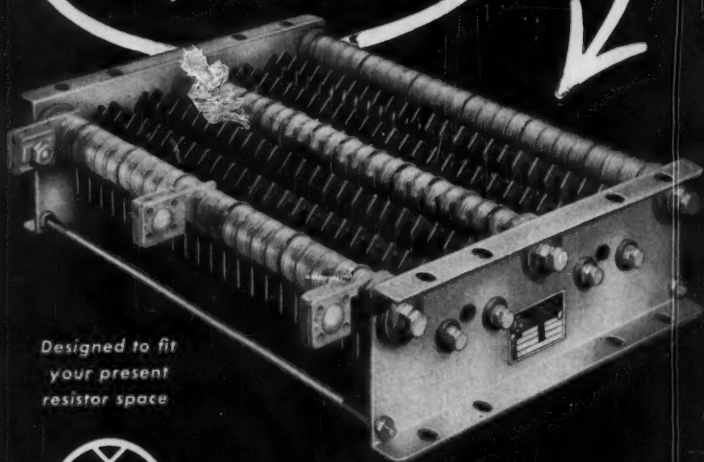
Investigate Hi-Torque brakes for your heavy duty vehicles...now available on several makes of equipment. For booklet write *B.F. Goodrich Aviation Products*, a division of *The B.F. Goodrich Company*, Dept. CA-12, Troy, Ohio.



Closeup of Hi-Torque brakes on shuttle car wheel. The cars are used over hilly, rocky and muddy terrain.

B.F. Goodrich Hi-Torque brakes

RUGGED
all the way thru!



Designed to fit
your present
resistor space



STEEL GRID RESISTORS

**consistently prove their value in
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By use of those durable raw materials . . . steel and mica, and the P-G exclusive features of design, these steel grid resistors have the "built-in quality" to overcome factors which often cause resistor failures. Vibration, moisture laden or corrosive atmospheres have little effect on continuity of service. Try Post-Glover Resistors for heavy duty applications where resistors are subject to severe service . . . continuous "Trouble-Free" performance is assured.



The Nonbreakable Steel Grid Resistor

THE POST-GLOVER ELECTRIC COMPANY

OFFICE and FACTORY—Kenton Lands Road, Erlanger, Kentucky

MAILING ADDRESS—Box 709, Covington, Kentucky

Equipment Developments

(Continued)

becomes operative. The reading circle, divided on glass, is said to offer exceptional accuracy. Special treatment of the glass surface reduces fungus molds from forming under humid conditions.

Free Bulletins

Mining Equipment—Eimco Corp., P. O. Box 300, Salt Lake City 10, Utah, offers three booklets—"Quality Products from Eimco," Form AP-20, listing most major products of the company including tractors, loaders, etc.; "Modern, Profitable Mining Methods with the Eimco 630 Crawler Series"; and "Shaft Mucking with the 630."

Sprockets and Excavators—LMG bucket wheel excavators and their use in continuous removal of overburden in open pit mines are the subject of a 14-min sound and color 16 mm film entitled "Performance Proven." Also available is a sprocket handbook, No. 2867, "Link-Belt Cast-Tooth Sprockets," which includes a listing of stock sizes. Both offered by Link-Belt Co., Dept. PR, Prudential Plaza, Chicago 1, Ill.

Face Protection—A completely new selection of eye and face protection for a wide variety of industrial applications is described in Brochure No. 0300-1 from Mine Safety Appliances Co., 201 N. Braddock Ave., Pittsburgh 8, Pa.

Lighting—A 12-p illustrated bulletin, No. B76, providing information on the types, construction details and varieties of stock components from which individualized portable lighting systems can be assembled, is offered by Joy Mfg. Co., Electrical Products Div., 1201 Macklind Ave., St. Louis 10, Mo.

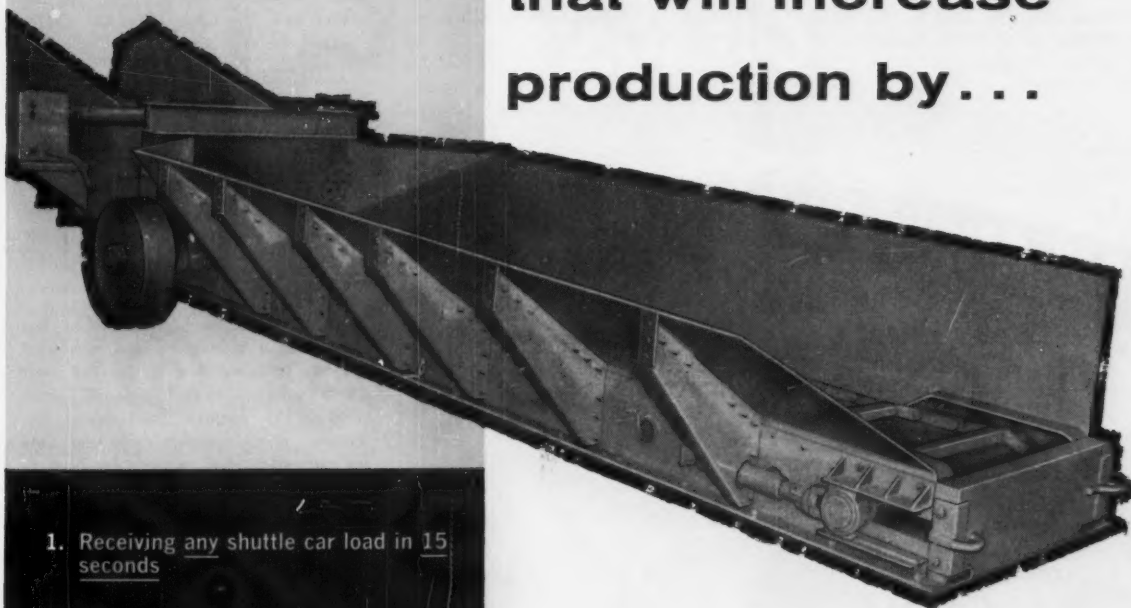
Testing Sieves—Booklet 608 covers 1960 revised specifications for testing sieves, embodied in the new ASTM Specification E-11-60-T. The bulletin also lists specifications being proposed as International Standards. Write W. S. Tyler Co., 3615 Superior Ave., Cleveland 14, Ohio.

Power Transmission—Wood's Catalog 23103 describes and illustrates company's complete line of mechanical power transmission equipment. T. B. Wood's Sons Co., Chambersburg, Pa.

Motor Grader Production—"Setting New Production Standards" sets forth production figures of the No. 14, Caterpillar's new big motor grader. The brochure, which also covers mechanical features of the No. 14, can be obtained

NOW!

**A belt feeder
that will increase
production by...**



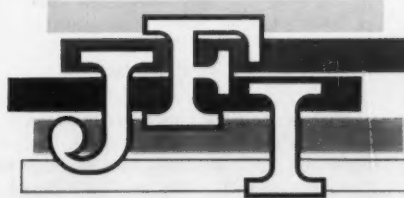
1. Receiving any shuttle car load in 15 seconds
2. Feeding the belt at any desired rate
3. Eliminating bottlenecks in multiple belt operations
4. Substantially reducing belt maintenance cost
5. Increasing belt conveying efficiency

The *Positive Performance* Jamison Belt Feeder—a new concept in material transportation—gives you more profit dollars from your mining operation. Engineered, developed and proven by Jamison, the *Positive Performance* belt feeder makes increased production at lower cost a reality.

Simplicity of design permits virtually maintenance-free operation, and labor costs are cut substantially through reduced belt maintenance.

Shuttle cars can discharge continuously into the system, which has no maximum input limit. Output is easily regulated; the reduction ratio is limitless and can be tailored to your specific needs.

For detailed information concerning the applications of the *Positive Performance* Jamison Belt Feeder for your mining operations, write today.



HUNKERS, PENNSYLVANIA

JAMISON FEEDER, INC.

TELEPHONE: WAlker 5-7200

Free Bulletins (Continued)

through Caterpillar dealers or by writing for Form DE005, Caterpillar Tractor Co., Peoria, Ill.

Flame Hardening Equipment—Form ADC 704A, a 12-p brochure, discusses the various problems of oxyacetylene flame hardening and shows how these problems can be solved with Airco equipment. All available equipment for the process is also covered. For your copy, write Air Reduction Sales Co.,

a division of Air Reduction Co., Inc., 150 E. 42nd St., New York 17, N. Y.

Dust Control Products—A new composite product bulletin, describing the complete line of dust control equipment manufactured by American Air Filter Co., has been released. Specify Bulletin No. 271 entitled "AAF Equipment for the Control of Dust" from Dept. PD, American Air Filter Co., Inc., 215 Central Ave., Louisville 8, Ky.

Materials Handling—The complete

line of Michigan construction and bulk materials handling equipment is described in 4-color Bulletin 150A available from Construction Machinery Div., Clark Equipment Co., Pipestone Plant, Benton Harbor, Mich.

Excavators—Design and engineering details of the 966, largest of Caterpillar's wheel Traxcavator line, are described in a 12-p book, Form No. 33915, released by the Adv. Div., Caterpillar Tractor Co., Peoria, Ill.

Centrifugal Pumps—Aurora Pump Div., New York Air Brake Co., Aurora, Ill., has available Bulletin 105-V covering the company's line of vertical single-stage split case centrifugal pumps. Identified as Type OJV and OMW, capacities of the new pumps range to 6,000 gpm and heads to 380 ft.

Speed Reducers—Link-Belt Co. has introduced a redesigned and expanded line of "balanced design" parallel shaft speed reducers available in 57 sizes. Book 2719, "Parallel Shaft Speed Reducers," gives complete selection data for each size. Send requests for book to Dept. PR of the company, Prudential Plaza, Chicago 1, Ill.

Steel Hardened Products—For complete information on "Tool Steel Process" hardened products for the strip mining industry, write for Bulletin 857, Tool Steel Gear & Pinion Co., Dept. V, Cincinnati 16, Ohio.

Bucket Conveyor—The "Piv-O-Bucket" conveyor combined with a vibrating feeder, which allows feeding materials at a more constant rate, is the subject of Catalog HB-1000 published by Conveyor Corp., 19815 E. Nine Mile Rd., St. Clair Shores, Mich.

Diesel Truck—A full-color, 6-p brochure containing specifications on the 931 series, Diamond T's biggest diesel, is offered by Diamond T Motor Truck Co., 4401 W. 26th St., Chicago 23, Ill.

Disc Filters—Bulletin 404 (3-ring punched) from Filtration Engineers, Div. of American Machine and Metals, Inc., East Moline, Ill., describes the features of the company's continuous vacuum disc filters.

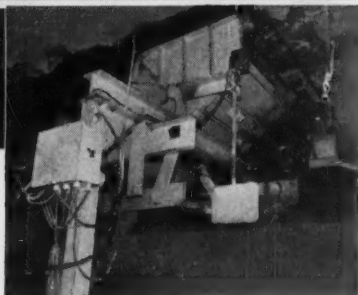
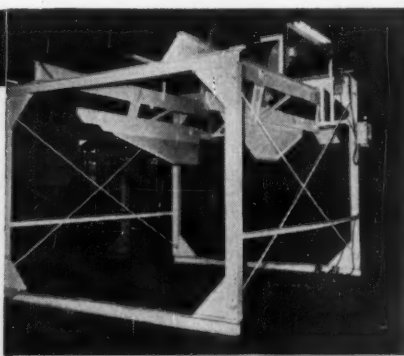
Mining Tools—Catalog M-10 presents mining tools and includes several styles of cutter bits not covered in the previous M-9 catalog. Write Mining Tool Div., Kennametal Inc., Bedford, Pa.

Rigging—A 16-p illustrated brochure giving specifications and working load limits for the company's line of alloy chain slings, rings, links and hooks has

For
BIG SAVINGS
in
**Time and Labor
Maintenance Expense
Installation Cost**

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**Check These
Features of the**

STAMLER
Automatic TILT PAN



- It automatically loads entire trip without belt stoppage or spillage between cars.
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- It operates with existing car spot-ers without special hydraulic power units.

- It operates with non-uniform car lengths.
- It is self-adjusting for dented car bodies.
- It automatically shuts down without spillage if the last empty car becomes loaded.
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- Fail safe under any emergency.

Get all the facts on the **STAMLER Automatic Tilt Pan**. Write today for folder.



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SALMON & CO., Birmingham, Alabama

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Free Bulletins (Continued)

been issued by the Wire Rope Div., Jones & Laughlin Steel Corp., Muncy, Pa. It also presents the design advantages of "Jallink," the company's permanent, tamperproof alloy chain connector link.

Centrifuge—Operating characteristics and component parts of the new Wemco-Siebtechnik vibratory screening centrifuge are explained and illustrated in Bulletin D1-B1, available from the Sales Prom. Dept. of WEMCO, a division of Western Machinery Co., 650 Fifth St., San Francisco 7, Calif.

Clamps and Couplings—Full production information on Marman's complete line of industrial band clamps, hose clamps, couplings, flanges and V-band joints is contained in Catalog No. 803, offered by Marman Div., Aeroquip Corp., 11214 Exposition Blvd., Los Angeles 64, Calif.

Arc Welding—A 16mm color and sound film, entitled "Fundamentals of Manual Shielded Arc-Welding Techniques," has been issued by Air Reduction Sales Co., a Div. of Air Reduction Co., Inc., 150 E. 42nd St., New York 17, N. Y. Adapted from General Electric Co.'s previously released 6-film series, "Inside Arc-Welding," the Airco film has been edited to 2 reels and runs 45 min.

Industrial Power Systems—"Better Power for Production" outlines principles of planning industrial power distribution systems for safety, reliability and economy while retaining flexibility and provisions for future expansion. Ask for Bulletin GEA-7139 from General Electric Co., Schenectady 5, N. Y.

Fluid Measurement—"AccuRay Continuous On-Stream Composition Analysis" describes the principles upon which continuous, non-contacting measurement of fluids in pipes is achieved. Request Bulletin CA-860 from Industrial Nucleonics Corp., 650 Ackerman Rd., Columbus 2, Ohio.

Belting—Boston Woven Hose & Rubber Div., American Biltrite Rubber Co., Boston 3, Mass., offers a 36-p "Boston" belting catalog which gives complete specifications and information on the company's full line of conveyor, elevator and transmission belting, including cross section illustrations.

Test Drilling Tools—Readers interested in the latest equipment, tools and accessories for soil sampling, auger boring, drilling and related subjects can obtain the information by writing Acker Drill Co., Inc., Box 830, Scranton 2, Pa.



ACCURATE, LIGHTWEIGHT, RUGGED...the perfect combination for efficient, convenient engineering work on roads, bridges, construction and tunnels. **IMPORTANT FEATURES** include 24 or 28 power telescope, internal focusing, coincidence-reading tubular level, and telescope rotatable around its longitudinal axis for rapid checking of level adjustments.

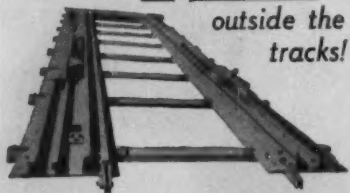


**WILD N-2
ENGINEER'S LEVEL**
One of a complete line of superb instruments for Surveying, Photogrammetry and Microscopy. Write for Booklet N-2.

WILD HEERBRUGG INSTRUMENTS, INC. • PORT WASHINGTON, NEW YORK
In Canada: Wild of Canada Ltd., 157 MacLaren St., Ottawa, Ontario

NEW NOLAN PORTA-FEEDER SPLIT-TRACK MODEL

features all automation
outside the
tracks!



**EASILY ACCESSIBLE!
EASILY CLEANED!
LESS LOST TIME!
MORE PRODUCTION!**

Cannot Clog from Coal Inside Track
Cannot Foul with Axles, Coupler,
or Brake Rigging on Mine Car

Regular Features:

- Push-button operated
- Mounts on top of ties
- No excavation necessary
- No valves on track unit
- Cushioned anchorage
- Hydraulically protected from shock and overload
- Simplified hydraulic system
- Constant forward feeding motion
- Secured by rail clamps with shock-absorbing springs. No holes required in rails
- Shortest on the market—only 6 feet longer than mine car!

The only COMPLETE line of car-spotting and car-loading equipment available!

WRITE FOR FREE CATALOG!

NOTE: Nolan makes a special model for drop-bottom cars. Nolan also makes a HOLD-A-TRIP for downgrades.



NOLAN SALES AGENTS:

George C. Hutchinson, Jr., 800 Keenan Bldg., Pittsburgh, Pa.
Huntington Supply & Equipment Co., 423 First Huntington Nat'l Bank Bldg., Huntington, W. Va.
E. C. Horne Machinery Co., 1726 Champa Street, Denver 2, Colorado
Frank C. Mammotti, P.O. Box 154, Castle Gate, Utah
J. L. Thomas, 429 S. 24th St., Birmingham 5, Ala.
John North Associates, P.O. Box 185, Harbert, Mich. (Chicago District)
Levitt Safety Limited, Toronto 10, Canada

THE NOLAN COMPANY
106 Pennsylvania St., Bowerston, Ohio

Among the Manufacturers

Howard A. Walters has been promoted to sales manager for Hulbert Oil & Grease Co., Philadelphia, Pa.



Walters

Previously a district manager for Hulbert, serving West Virginia, Virginia, Kentucky, Tennessee, Alabama and Indiana, Mr. Walters joined the company in 1952 and today heads all national sales and field engineering projects for the firm. His first association with the coal industry was 30 yr ago as an electrician's helper. After receiving his degree in electrical engineering and progressing to chief electrician and assistant superintendent, he joined the Sullivan Machinery Co., now a division of Joy Mfg. Co. and in 1946 he was employed by Clarkson Mfg. Co.

Paul C. Manley has been appointed vice president and general manager for Long-Airdox Co., Oak Hill, W. Va., and Chicago, Ill.



Manley

In his new capacity, Mr. Manley will supervise overall operations of the company and coordinate the manufacturing activities of Long-Airdox plants in West Virginia, Pennsylvania, Iowa and Illinois. Associated with the mining industry for more than 25 yr, he was named a vice president in March, 1960, when Airdox-Cardox Products Co. merged with Long Co. to form the Long-Airdox Co.

John Robert Tench became vice-president in charge of sales of industrial batteries of Gould-National Batteries, Inc. and will headquarter in Trenton, N.J. He has held several executive positions with Gould, the last of which was vice-president of personnel and labor relations. Prior to joining Gould, he was associated with Follansbee Steel Corp. and Blaw Knox Co.



Tench

Mr. Tench succeeds M. W. Heinritz who will remain with the company as a vice president and will be associated with the Industrial Div. in an advisory capacity.

Howard C. Human has been appointed a sales engineer for Goodman Mfg. Co., Chicago.



Human

Mr. Human, a graduate mining engineer of the University of Kentucky, has had mining experience with the Island Creek Coal Co., Princess Elkhorn Coal Co. and most recently with the Old Ben Coal Corp. where he served as superintendent of their Glen Rodgers mine in West Virginia.

Richard F. Wesner, formerly general manager of the Boone County Coal Corp., has re-joined McNally Pittsburg Mfg. Corp. as sales engineer.



Wesner

He will be associated with the Wellston, Ohio, office. A graduate of Pennsylvania State University with a BS degree in mining engineering as well as an MS degree, Mr. Wesner had been employed by McNally Pittsburg prior to his association with Boone County Coal.

Fred J. Ebeling has been named director of sales for Dodge Mfg. Corp., Mishawaka, Ind., with the retirement of Harry A. Torson, vice president in charge of sales.



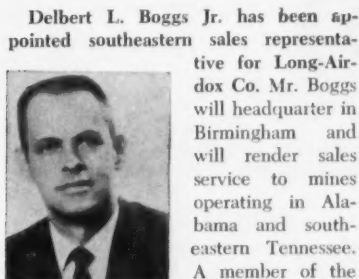
Ebeling

Mr. Ebeling had held positions with Muessel Brewing Co., later Drewry's Ltd., before joining Dodge Mfg. in 1943 as credit manager. A short time later he became assistant secretary and assistant treasurer. He was transferred to sales in 1952 as general sales manager and in that position worked closely with Mr. Torson in directing the company's growing marketing organization. Mr. Torson will continue to render advisory and consulting services on a part-time basis.

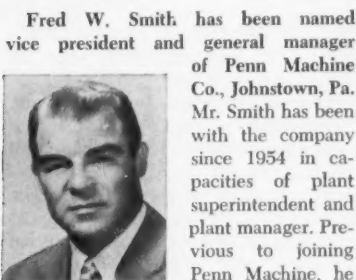
Jules C. Laegeler has been appointed vice president in charge of engineering for Frank C. Hough Co. Mr. Laegeler, who formerly held the position of chief engineer, has been with the company since 1951.



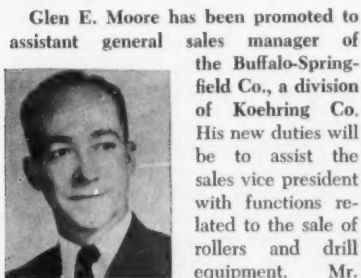
Miller
sales engineer with the American Optical Co. from 1950 to 1954 and sales manager for Pennsylvania Optical Co.



Boggs
Polytechnic Institute, he has held positions with the U. S. Gypsum Co. and Alabama Power Co.



Smith
house Electric Co. for 18 yr. Also announced was promotion of **Robert J. Fox** to general foreman in charge of all shop operations.



Moore
administrative assistant to the president of the Stardrill-Keystone Co. prior to Koehring's acquisition of that company.

COAL AGE • December, 1960

2 ways Gates high capacity V-Belt Drives contribute to industry profits



ON IN-PLANT EQUIPMENT, Gates Super HC V-Belt Drives lower maintenance costs—as on this pump at Scott Paper Company's Detroit plant. The pump was formerly driven by a special belt, but 6 of these belts failed in about 3 months. In comparison, a Super HC Drive has been operating for the past year with NO down time and NO replacement cost.

A little more than a year ago Gates introduced a new high capacity V-belt—a slimmer, tougher, more flexible V-belt with far greater capacity to transmit horsepower than conventional belts.

Because this revolutionary V-belt permits narrower sheaves, fewer belts, and closer center distances, hundreds of plants across the country have found Gates Super HC V-Belt Drives contribute to profits in



ON EQUIPMENT FOR SALE, Super HC High Capacity V-Belts produce savings all down the line—as on these sand pumps being readied for shipment from Denver Equipment Company's plant. With Super HC, sheave dimensions can be reduced 30% to 50%, overall space up to 50%, drive weight by 20%, and drive cost by as much as 20%, compared to previous drives.

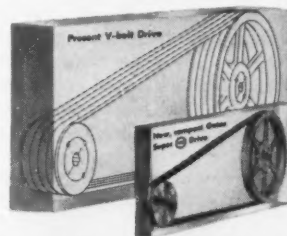
2 ways: through marked savings in drive costs on production machines within the plant and on powered equipment manufactured for sale.

Gates V-Belt Distributors and Field Engineers are listed in the Yellow Pages in all major industrial centers. Ask your distributor for the handbook, *The Modern Way to Design V-Belt Drives*. TPA 544

The Gates Rubber Company, Denver, Colorado
Gates Rubber of Canada Ltd., Brantford, Ontario



The Mark of Specialized Research



same hp capacity in smaller "package"

GATES SUPER V-BELT DRIVES

WHAT WOULD HAPPEN IF ALL ADVERTISING STOPPED?

Stores would begin cancelling orders. Very quickly, manufacturers would close down plants and lay off millions of employees. Volume production would be a thing of the past ... and so, prices would rise fast.

Within a week most radio and television stations would close up shop for lack of revenue. The ability of many newspapers and magazines to perform their full, vital functions would be seriously impaired. And the cost per copy would zoom for those that tried to keep running only on circulation revenues.

This alternative to advertising can hardly be the goal of the critics of advertising. Without advertising our national economy, our national life, would be bleak indeed. In many ways, advertising is the power plant of our society.

MORE CUSTOMERS FOR MORE PRODUCTS—American creative genius and wonderful ability for organization have resulted in a tremendous flow of goods of all kinds. This creates a crucial need for masses of people anxious, willing and able to buy and consume these goods. Only a society with a constantly rising standard of living can provide the customers. These customers have to be sought, taught and often persuaded to move higher in the scale of living. This is the job of advertising.

Advertising not only gives people news about new products, but provides the urge for people to own and enjoy these products. The wider and deeper the penetration of our products into the life of America, the greater the need for more production. This means more jobs. More jobs mean more people able to enjoy what we make. More people buying means more, still more production. And so on and so on. The result is that more Americans can enjoy more of the fruits of their labor than people in any country anywhere in the world can enjoy theirs.

ADVERTISING LOWERS PRICES—Does advertising raise the cost of goods? On the contrary. Through newspapers, television, magazines, radio and billboards, an advertiser can talk to a prospect for a tiny fraction of a cent. Advertising is the quickest and cheapest way of reaching large numbers of people. It enables the advertiser to reach his market (customers) inexpensively and thus increase his total production, thereby reducing the cost of making and selling each unit.

THE CULTURAL EFFECTS OF ADVERTISING—It's because of advertising that our mass media of communication can afford to command the finest talent for bringing to the

American people information, stimulation, entertainment and education which in other countries are available to just a very few people.

Advertising makes its cultural contribution in another way. Advertising is in large measure responsible for better living, less drudgery, more leisure for more people. This creates opportunities for intellectual and spiritual activities equaled in few, if any, other countries. While millions and millions of dollars are being spent by Americans for cars, boats, sports equipment and the paraphernalia of leisure, there is a growing hunger for improvement of the mind and for aesthetic enjoyment.

WHAT ARE THE "NEEDS" OF THE PEOPLE?—Critics of advertising sometimes indict it for creating dissatisfaction in people's minds with what they have, and persuading and cajoling them into buying what they neither need nor want. But what are "needs?" The "needs" of people in undeveloped countries are not the same as our needs. Our needs of 50 years ago are not the same as they are today. We don't actually "need" electric razors, electric refrigerators, vacuum cleaners, television sets, shampoos, beauty treatments, packaged goods, or even automobiles. But would the critics of advertising stop encouraging people to want a better life? Would they have the millions of people who create, produce, and market the so-called "non-essentials" thrown out of jobs? Do they want us to go back to the more primitive living of other countries?

ADVERTISING—PUBLIC SERVANT—Frequently, the advertising industry is called on to direct public-service jobs—for the Government as well as for private public-service organizations. This it does through the Advertising Council, a non-profit organization supported by American business and advertising media. Here's what President Eisenhower said to the Advertising Council in Washington several months ago:

"For eighteen years you have been stimulating the nation's conscience in areas where the voluntary work of great numbers of people has been necessary in order to promote worthwhile causes. I know you have been in such fields as conservation, organized charities, safety, prevention of accidents, and more recently in giving your efforts to the job of pointing out to our people the need for self-discipline if we are to avoid debasement of our currency and prevent inflation.

"And I think no other body has done more in this regard in trying to inform America across the board of these things than The Advertising Council."

COAL AGE

January to December 1960
Index to Volume 65

The articles and references compiled in this index have been listed alphabetically. A subject related to a major topic has been listed under the major topic. For example, an article dealing with a new mining machine and its operation will be found under the topic, "Mechanization." An article on shuttle cars will

be found under "Transportation." Unclassified articles, or those that cannot be placed in any major category, have been listed within the index alphabetically. Editorials, marked (E), will be found under the subject with which they are concerned. Many titles are abbreviated to give prominence to important words.

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CONSTRUCTION ENGINEER

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Engineer with background in mining. Must
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qualified in design and building of small rail-
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Twelve-month assignment abroad—family
transportation paid. Salary to \$18,750.00
plus housing, subsistence and other benefits.

Send complete resume including earnings to
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Graduate mining engineer with well-rounded
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This land is underlaid with five to twelve foot
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Has purchased the St. Ellen Mine of Peabody Coal Company, O'Fallon, Illinois, located on U. S. Route 50, approximately fifteen miles east of St. Louis, Missouri. The entire stock of equipment and approximately 400 acres of land are being offered for sale at bargain prices.

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Night Phone: MErcury 2-5887

THE FOLLOWING IS A PARTIAL LISTING OF EQUIPMENT FOR SALE AT THE MINE SITE

SHUTTLE CARS, 250 VOLTS DC

- 11—Joy 10SC Shuttle Cars, right and left hand drive.

CUTTING MACHINES, 250 VOLTS DC

- 5—10RU Joy Cutting Machines.
5—324 AA Goodman Slabbers—Track Gauge 42".

TROLLEY LOCOMOTIVES, 42" TRACK GAUGE FOR 250 VOLT DC

- 1—13 ton Goodman—Type 81A04T, completely modern.
1—Goodman 13 ton 136B-0-4-6 with 2—75 H.P. Motors.
2—13 ton Jeffrey Locomotives (1—inside frame and 1—outside frame).
1—Goodman 5 ton 3013 with 1—50 H.P. Motor
4—8 ton 132AK42-48R Goodman with 2—50 H.P. Motors with reels.
1—8 ton 32-0-4-T Goodman with 2—50 H.P. Motors with reels.
1—8 ton LM2-5-T-DD General Electric with 2—50 H.P. Motors with reels.
3—6 ton LM2-T-6MM General Electric with 2—35 H.P. Motors with reels.
2—6 ton LM2-4-6-11 General Electric with 2—35 H.P. Motors with reels.

BATTERY LOCOMOTIVES, 42" TRACK GAUGE

- 18—Greensburg Monitors complete charging equipment and batteries.
8—Mancha Locomotives complete with charging equipment and batteries.

LOADING MACHINES, 250 VOLTS DC

- 8—11BU Joy Loading Machines, completely modern with separate pump motors.
8—360 Goodman Loading Machines.

MOTOR GENERATOR SETS

- 7—General Electric 300 KW Motor Generator Sets, 1200 RPM, primary voltage 2300/4160, 275 Volts DC, complete with panel boards.
3—General Electric 200 KW Motor Generator Sets, primary voltage 2300/4160, 1200 RPM, 275 Volts DC, complete with panel boards.
1—Westinghouse 200 KW Motor Generator Set, 1200 RPM, 2300/4160 primary voltage, 275 Volts DC, complete with panel boards.
2—Westinghouse 150 KW Motor Generator Sets, 1200 RPM, 2300/4160 primary voltage, 275 Volts DC, complete with panel boards.

CONVEYORS

- 5—Joy PL 11 Elevating Conveyors.
8—Joy PL 11 Side Dumps.

BELT CONVEYORS

- 1—Hewitt-Robins Slope Conveyor, 980 ft. long, 42" wide, equipped with 200 H.P. 440 Volt AC Drive (also 50 H.P. 440 Volt AC Motor for man trip), complete with 42" x 6 ply Rubber Conveyor Belt, Ajax Raynile #130 1/4" top cover and 1/16" bottom cover with Nylon Breaker.
2,128 feet of Jeffrey 36" wide structure in 8 ft. sections.
4,000 feet of Rubber Belt 36" wide.
1—40 H.P. Goodman 36" Belt Drive with Tail, 250 Volts DC.
1—Robins Belt Conveyor 36" wide, 150 ft. long complete with Allis-Chalmers, 30 H.P., 220/440 Volt AC Drive.

MINE CARS

- 100—AC&F, Three-Door Drop Bottom Mine Cars, 48" High, 17 ft. 7 1/4 in. overall length, capacity 271 cubic feet level full, 42" gauge.
100—Sanford-Day Three-Door Drop Bottom Mine Cars, 38" high with an 8" sideboard, 16 ft. 10 1/2" overall length, 42" gauge.

WIRE MATERIAL

- 21,400 ft.—4/0 Round Return Wire.
8,600 ft.—500,000 CM.
50,000 ft.—1,000,000 CM.
82,600 ft.—6/0 Trolley Wire.
8,000 ft.—4/0 Rubber Covered 4000 Volt Feeder Cable.

TRACK MATERIAL

- 64,800 ft.—40# Track.
154—40# Switches.
10,800—40# Ties.
100,400 ft.—60# Track.
51—60# Switches.
7,000—60# Ties.

COMPLETE FOUR-TRACK TIPPLE CAPABLE OF HANDLING 10,000 TONS OF COAL PER DAY PARTIAL LIST OF MAJOR ITEMS OF TIPPLE:

- Sizes of coal: from 1/4 x 0 to 7 x 4" Block.
CMI 48" Dryer—complete with motors, drives, belt, etc., screen cloth 1/16" opening capacity 90 ton per hour.
1—Coppus Ventair Blower #24708.
Pulverizers: (American Pulverizers) 4—#305, Ser. #3218—AC3, Serial #1798, AC3B, Ser. #3127, WC-24, Ser. #3240.
5—8 x 6 Allis-Chalmers Centrifugal Pumps, complete with motors (4) breakers.
1—16 x 14 Allis-Chalmers Centrifugal Pump, complete with motor, starter, breakers.
1—Roberts & Schaefer Electric Vibrator.
1—Roberts & Schaefer Air Drying Plant, complete (specifications furnished on request). Consists of Belt & Chain Conveyers complete with motors, drives, 36" Belt also some 24" and 30" Belt.

WELDERS

- 1—Lincoln, 300 amp. M.G. Set.
2—Hobart, 300 amp. M.G. Sets.
1—G.E., 400 amp. M.G. Set.
4—Guyan 200 amp. Resistance Welders.

AUTOMATIC RECLOSING BREAKERS

- 4—1600 amp. I.T.E. Modern with reverse current relay.

AIRDUX EQUIPMENT

- 5—Armstrong 60 H.P., AC 440 Volt Compressors.
5—Armstrong Coal Breakers, Model EB-301.
5—G.E. Motors 60 H.P., Type K, Frame 504, 220/440 Volt AC, 1180 RPM.
Auxiliary equipment and controls complete with 16,100 feet of Airdux Pipe.

PORTAFEEDER

- 1—Nolan Portafeeder.

COAL DRILLS

- 5—Manson Trucks—10 H.P., DC Tram Motors on 4, 7 1/2 H.P. DC Tram Motors on 1, Joy 9 J Motor with Reduction on 1. Each drill truck has 2 drill arms with 2 Chicago Pneumatic 580 Drills 7 1/2 H.P., DC.
3—Manson Track Trucks, each truck with 2 drill arms & 2—580 drills.
2—Manson Track Trucks, without drills.
9—Dooley Rubber Tired Trucks, equipped with two arms and two 580 drill motors.

ROOF DRILLS

- 1—Joy RBD-7 with 15 H.P. Reliance Permissible DC and mounted on Manson with 7 1/2 H.P. Westinghouse on Rubber.
1—Jeffrey 56 R.D. with 15 H.P. Motor DC, arm is mounted on Manson Track Truck.
1—Dooley (Rubber Tired) Drill Truck, equipped with Vertical Drilling 580 Drill Motors.

ROCK DUSTERS

- 1—American Mine Door Road Cleaner.
2—MSA Rock Dusters, 25 H.P. Track.
3—MSA Bantam Rock Dusters, 2 H.P.

TRUCKS

- 4—(Shop Built) Mobile Repair Trucks.
4—Personnel Jeeps, 42" Track Gauge.

FANS

- 1—Jeffrey Aerodyne Fan, Serial No. 8687 complete with G.E. 100 H.P., 440 Volt AC Motor and Auxiliary Ford Industrial Power Unit gasoline driven.
1—4 ft. Jeffrey Aerodyne Fan complete with 60 H.P., 220/440 Volt AC Motor and Auxiliary Ford Industrial Power Unit gasoline drive, complete with all necessary equipment and controls.

TRANSFORMERS

- 3—2400/4160 V, 240-480 Volts, 100 KVA General Electric Single Phase Transformers.
2—2400/4160 V, 240-480 Volts, 333 KVA General Electric Single Phase Transformers.
3—2300/4160 V, 230-115 Volts, 200 KVA General Electric Single Phase Transformers.
3—2300/115/230 Volt, 15 KVA General Electric Single Phase Transformers.

SUPPLY HOUSE

- Complete inventory of new parts for 10SC, 10RU and 11BU Joy Equipment plus cable, tools, hardware, etc. for operation of mine.

BATHHOUSE EQUIPMENT

- 355—Baskets with Chains, 20 shower heads and complete equipment for operation of bathhouse.

LAMP HOUSE

- 360—R4 Lamps complete with necessary charging equipment.
25—Flame Safety Lamps.

MOBILE EQUIPMENT

- 1—Koehring Heavy Duty Crane—C5521.
1—Shovel Dipper Stock for same—Size 301, Serial No. 61, Length 16 feet—3/4 yard dipper.
1—International 1950 Flat Bed Truck Tandem with steel bed and winch, Ser. #3438, 3 axles, weight 18,500 lbs.
1—Hough Pay Loader, Model HF and HFN, Serial No. 81221.
1—Allis-Chalmers Tractor HD9-827.
1—Allis-Chalmers Tractor Hi Lift—Model HD5, Model #24-27482, Serial No. 22246.
1—Caterpillar Tractor D6, 60" Gauge, Serial No. 5R4778.
1—Whiting Track Mobile, Serial #TM-209.
1—Roller—W. M. Bros. Boiler Mfg. Co., Model 678, Ser. #RR-2734, weight 2950 lbs.

COMPLETE SHOP AND OFFICE EQUIPMENT

STATIONARY MOTORS

- AC and DC Motors ranging from 1 to 300 H.P.

GENERAL MISCELLANEOUS

- Hundreds of other items such as pumps, motors, armatures, locomotive trucks, wheel units, hydraulic pumps, conveyor chains, cat chains, tippie draglines, etc., too numerous to list.

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JOY EQUIPMENT—REBUILT

- 6—Joy 148U 9AE—26" Hi—New 1958.
- 3—Joy 148U Loaders, low pedestal, 7AE, 1956 & 57.
- 3—Joy 148U Loaders, medium pedestal, 7RBE.
- 1—Joy 148U 7CE high pedestal loader.
- 4—Joy 148U 3PE Loaders.
- 2—Joy 128U Loaders complete with Piggybacks.
- 2—Joy 128U Loaders, 9E, latest type, 250 V. DC.
- 5—Joy 128U Loaders, 220/440 Volt AC.
- 1—Joy 208U Loader, latest type.
- 4—Joy 118U Loaders, latest type.
- 1—Joy 88U Loader, 34" overall height.
- 2—Joy 88U Loaders, 220 V. AC.
- 1—Joy curved Bar Head for 148U, complete.
- 6—Reliance 24-J Motors, 7½ H.P.
- 4—Reliance 38-J Motors, 10 H.P.
- 20—9-J Motors, 4 H.P.
- 2—Goodman 660 Loaders on Crawlers 440 V. AC, like new.
- 1—Goodman 660 Loader on Crawlers, excellent 250 V. D.C.
- 1—Goodman 665 Loader on Crawlers, latest type 250 V. DC.
- 1—Goodman 865 Loader, 26" hi. Rebuilt. 250 V DC.
- 4—Joy 8SC Shuttle Cars, rebuilt.
- 4—Joy 6SC Shuttle Cars, rebuilt, latest type.
- 1—Joy 5SC Shuttle Car. Excellent.
- 2—Joy 32E9 Shuttle Cars.
- 2—Joy 32E10 Shuttle Cars, rebuilt.
- 6—Joy 32E15 Shuttle Cars, rebuilt.
- 4—Joy 32E16 Shuttle Cars, rebuilt.
- 10—Joy 42E16 Shuttle Cars, rebuilt.
- 1—Joy CD-22 Drill, on rubber, like new.
- 6—Joy T-2.5 low pan Crawler Trucks, rebuilt.
- 1—Joy T-2.6 low pan Crawler Truck with reel.
- 2—Joy T-1 Standard Crawler Trucks, 220 AC.
- 1—Joy T-1 Standard Crawler Truck, 250 DC.
- 4—Joy 11-B Cutting Mach., like new, 35 & 50 H.P.
- 1—Joy 7-B Cutting Machine, like new, 250 V. DC.
- 2—Goodman 212 Cutting Machines, 19" high.
- 1—Goodman 312 Cutting Machine, 17" high.
- 3—Goodman 412 Cutting Machines, 19" high.
- 1—Goodman Machine on Crawler, 31" high. All hydraulic.
- 6—Goodman 512 Machines with Bugdusters.
- 6—Goodman 612 Cutting Machines, 250 and 500 V.
- 1—Jeffrey 70 URB rubber tired Cutter, Universal head, perfect condition.
- 1—Goodman 2410 Rubber Tired Cutter, Universal head, like new.
- 3—Joy 11RU Rubber Tired Cutters with bugdusters, Universal heads, dual tires, like new. 250 V. D.C.
- 2—Joy 10RU Rubber Tired Cutters, Universal head, 220/440 V. A.C. Perfect.
- 4—Joy 10RU Rubber Tired Cutters, Universal head, 250 V. D.C.
- 6—7AU's on track. Universal head.
- 2—Jeffrey 29UC Cutting Machines, Universal head, cuts anywhere in seam, 38" high, on Crawlers, 250 volt D.C.
- 1—Jeffrey 29LC on Crawlers, rebuilt.

LOCOMOTIVES

- 1—Goodman 6 ton, 93-A, 27" high, armor plate frame.
- 1—Jeffrey 15 ton MH-77 Locomotive, armor plate frame.
- 3—Jeffrey, 13 ton, type MH-110, 36", 42", 44" ga.
- 2—Jeffrey, 10 ton, type MH-110, 42" and 44" ga.
- 2—Jeffrey, 10 ton, type MH-78, 42" and 44" ga.
- 2—Goodman 8-30 and 10-30 Locos., 26" above rail.
- 1—Jeffrey MH-121, 4 ton, like new, with reel, 24" overall height.
- 2—Jeffrey MH-150, 6 ton, 26" overall height, rebuilt, with reel.
- 12—Jeffrey, 6 ton, type MH-88, 42", 44" and 48" ga.
- 4—Jeffrey, 8 ton, type MH-100 2½" armor plate frames.
- 1—Jeffrey, 6 ton, type 2186, 22" above rail.
- 3—Jeffrey, 4 ton, type MH-96, 42", 44", 48" ga.
- 1—G.E., 4 ton, type 825 Locomotive, 22" high.
- 10—G.E., 6 ton, types 801, 803, 821 Locomotives, 42", 44" and 48" ga.
- 1—G.E., 8 ton, type 822 Locomotive, 44" ga.
- 3—G.E., 10 ton, type 809 Locomotives, 42", 44" and 48" ga.
- 2—G.E. 13 ton, type 829 Locomotives, armor plate frames.
- 1—Goodman 91A Locomotive, 8 ton, 26" overall height.
- 2—Goodman, type 33, 6 ton, 44" and 48" ga.
- 2—Westinghouse, type 902, 4 ton, 42" and 48" ga.
- 2—Atlas Battery Locomotives 36" ga.
- 1—Atlas Trolley Locomotive, 4 ton, 24" high.
- 1—Ironton Battery Locomotive, 4 ton, 24" high, excellent, with charger.
- 2—Westinghouse, type 904, 6 ton, 44" and 48" ga.
- 2—Westinghouse, type 906, 44" and 48" ga.
- 2—Westinghouse, type 907, 10 ton, 44" & 48" ga.

- 8—Jeffrey MH-78 Locomotive Units, cheap.
- 4—Jeffrey MH-88 Locomotive Units, real bargains.
- 6—Jeffrey MH-100 Locomotive Units, reasonable.
- 3—Plymouth Diesel Locomotives, 8 and 10 tons, 42" and 44" ga.

Locomotive Trucks & Spare Armatures for the above.

TIPPLE EQUIPMENT

- 1—All Steel 5 Track Tipple, new 1957, complete with washer, silo, oil treating system, all bolted construction.
- 1—Complete Five Track Tipple with Washers and Air Tables.
- 1—Complete stoker plant, all steel.
- 2—Complete Tipples, 3 & 5 track, steel and wood.
- 3—Cleaning Plants, 1 Ea. McNally, Roberts and Schaefer, Jeffrey, Washers and Air-Flo Tables.
- 4—Complete Aerial Trams for coal or refuse.
- 3—Complete Rope and Button Lines.
- 2—Monitor Lines complete with Drums, excellent.
- 1—Allis-Chalmers 5' x 12" Ripplio Vibrator.
- 1—Allis-Chalmers 4' x 12" Low-Head Vibrator.
- 1—Robins Gyrex Vibrator, 4 x 10.
- 10—Belt and Apron type Loading Booms.
- 6—Shaker Screens.
- 1—Robins Car Shakeout.
- 20—Crushers, various sizes—Jeffrey, McLanahan & McNally.
- 4—Mine Scales, 10 & 20 ton.
- 5—Truck Scales, 25 to 40 ton, late type.

Feeders, Belt and Drag Conveyors, Car Retarders.

CUTTING MACHINES

- 1—Joy 10RU Rubber Tired Cutter, Universal head 220/440 volt A.C. Perfect.
- 3—Joy 10RU Rubber Tired Cutters, Universal head, 250 V. D.C.
- 2—Joy 11RU Rubber Tired Cutters, 250 V. D.C.
- 1—Goodman 2410 Rubber Tired Cutter, Universal head, new 1956, Excellent.
- 2—Jeffrey 29UC Universal Machines on Crawlers.
- 1—Goodman on Crawlers, 31" overall height.
- 3—Baby Goodman 212's, rebuilt, 250 V. D.C.
- 2—Goodman 212 Cutting Machines, 19" high.
- 4—Goodman 312 Cutting Machines, 17" high.
- 3—Goodman 412 Cutting Machines, 19" high.
- 6—Goodman 512's, with Bugdusters, like new.
- 4—Goodman 512's, rebuilt, or as removed from service.
- 6—Goodman 612's—250 & 500 Volt.
- 3—Goodman 112's, 220/440 V. A.C.
- 1—Joy 7-B Cutting Machine, 250 V. D.C.
- 4—Joy 11B Cutting Machines, rebuilt, 35 & 50 H.P.
- 6—7AU's, on track, Universal Head.
- 10—Goodman 12AA's and 112AA's, 250 V. D.C.
- 2—Goodman 724 Slabbers.
- 2—Goodman 824 Slabbers.
- 6—Jeffrey 35L's, like new, 250 V. D.C., 17" high.
- 2—Jeffrey 35L's, on low vein trucks.
- 2—Jeffrey 35BB's, 220/440 A.C.
- 3—Jeffrey 35BB's, 220/440 A.C.
- 15—Jeffrey 35B's and 35BB's 250 V. D.C.
- 2—Jeffrey 29B's on track.
- 10—Jeffrey 29C's, track mounted.
- 2—Jeffrey 29L's, on Crawlers, Excellent.
- 1—Sullivan CE7, 220/440 V. A.C.

CONVEYORS

- 2—Goodman 97HC 30" & 36" Rope Belts, 1600' perfect. With or without rubber.
- 2—Jeffrey 52-B tandem drive 30" Belt Conveyors, 1,500'.
- 1—Jeffrey 52-B tandem drive 26" Belt Conveyor.
- 1—Joy 30" Underground Belt Conveyor. Excellent.
- 1—Goodman 97-C, 30" tandem drive.
- 1—Goodman 97-C, 26" Conveyor, 1,000' long.
- 1—Robins 36" tandem drive, with or without structure.
- 1,200' Robins 36" Underground Structure, like new.
- 1,000' Conveyor Belt, 42" ga.
- 4,000' Conveyor Belt, 36" ga.
- 3,000' Conveyor Belt, 30" ga.
- 4,000' Conveyor Belt, 26" ga.
- 8—Jeffrey 61AM 12" Chain Conveyors, 300'.
- 2—61EW Elevating Conveyors.
- 2—61WH 15" Room Conveyors, 300'.
- 2—Joy 15" Room Conveyors, 300'.
- 2—Joy 20" Conveyors, 300'.
- 4—Joy Ladel UN-17 Shakers.
- 10—Goodman G-12½ and G-15 Shakers.
- 1,000' Goodman 18" Flat Belt Conveyors, tandem drive any length. Perfect.

CONVERTERS AND DIESEL PLANTS

- 1—300KW Portable Rectifier, 3 car unit, excellent.
- 2—500KW G.E. Stationary Rectifiers.
- 4—1,000KW Stationary Rectifiers.
- 2—100KW G.E. TCC-6's, 275 V., Rotary Converters.
- 1—150KW G.E. HCC-6, 275 V., Rotary Converter.
- 1—150KW, 6 phase, Allis-Chalmers Rotary Converter, 275 V. D.C.

- 2—200KW G.E. HCC-6's, Rotary Converters, 275 V. D.C. Steel frames. Newly rewound.
- 3—300KW G.E. HCC-6's, Rotary Converters, 275 V. D.C. Like New.
- 2—300KW Westinghouse, 6 phase, Rotary Converters, 275 V. D.C.
- 2—500KW West. Rotary Converters, 275 V. D.C.
- 2—200KW Westinghouse Rotary Converters, 275 V. D.C. Newly rewound.
- (All the above with 6900/13000 and/or 2300/4000 primary transformers)
- 2—100KW MG Sets, 275 V. D.C.
- 2—150KW MG Sets, G.E. and West., 275 V. D.C.
- 1—200KW MG Set, West., rebuilt, 275 V. D.C.
- 1—200KW MG Set, G.E., perfect, 275 V. D.C.
- 2—300KW G.E. MG Sets, like new.
- 1—300KW Westinghouse, 600 volt MG Set, rebuilt.
- 2—300KW Westinghouse, 600 volt, 6 phase, Rotary Converters.
- 2—500KW Westinghouse, 600 volt, D.C., 6 phase, Rotary Converters.
- 2—500 KW HCC-6's, Rotary Converters, 6 phase, 600 V. D.C.
- 1—GMC-471 Diesel with 60KW, 250 V. D.C. Gen.
- 3—GMC-671 Diesels with 75KW, and 110KW, 250 V. D.C. Gen.

LOADING MACHINES

- 16—Joy Loaders, 148U, 128U, 88U, 118U, 208U.
- 5—Joy 128U9E Loaders, 220/440 V. A.C. Excellent.
- 3—Joy 128U9E Loaders, latest type.
- 2—Joy 128U with Piggyback Conveyors.
- 2—Goodman 865 Loaders, 26", on Crawlers.
- 1—Goodman 665 Loader, on Crawlers, rebuilt.
- 2—Goodman 660 Loaders, 440 V. A.C., perfect.
- 1—Goodman 660 Loader, on Crawlers, 250 V. D.C.
- 1—Goodman 460, on track, rebuilt, all hydraulic.
- 2—Jeffrey 61 CLR's on rubber, 26".
- 3—Jeffrey L-500 Loaders.
- 2—Myers Whaley, No. 3 Automatic Loaders.
- 2—Clarkson Loaders, 26" above rail.

MISCELLANEOUS

- 150 Tons Copper—4/0 and 9 Section Trolley 1/0, 2/0, 4/0 Stranded. 750 MCM—1,000,000 MCM Insulated.
- 1 Each 4'-5", 6' & 8' Hi Pressure Joy & Jeffrey latest type fans.
- 1—Complete Five Track Tipple with Washers and Air Tables.
- 5—Complete Tipples, 3 to 5 Track. Wood and Steel.
- Steel Trestles for drop bottom cars.
- All Steel Armco Buildings.
- 20—Jeffrey Molveyors on rubber tires.
- 1—¾ Yard Shovel and Back-Hoe.
- 1—¾ Yard Crawler Crane.
- Battery Supply Tractors, Rubber Tired.
- 1—Cantrell Air Compressor on rubber tires.
- 10 Air Compressors, 1 H.P. to 40 H.P.
- 2—Joy self-propelled rubber tired comp., 240 cu. ft.
- 2—Acme self-propelled rubber tired compressors, 130 cu. ft.
- 40—Mine Pumps, all types.
- 1—Differential 40 Passenger Man-Trip Car.
- 6—MSA Rock Dusters.
- 2—Philips Carriers, 44" and 48" ga.
- 1—Barber-Greene self-propelled Bucket Elevator.
- Pipe, Plastic, Steel, Transit, all sizes 1" to 6".
- 25,000 Roof bolts, all types.
- 300—Mine Cars, drop bottom, 42" ga.
- 90—Mine Cars, drop bottom, 44" ga.
- 50—Mine Cars, drop bottom, 48" ga.
- 100—Mine Cars, 18" high, end dump, 44" ga.
- 300—Mine Cars, end dump and drop bottom, 20" high, 48" ga.
- 1—10 ton Mine Car Scale with Recorder.
- 4—Brown Fayro 15 HP latest type Hoists.
- 15—Brown Fayro HKL and HG Car Spotters.
- 1—Brown Fayro Hydraulic Car Spotter.
- 1—12 ton Differential Slat Lorry.
- Incline Hoists, 25 to 50 H.P.
- 1—Jeffrey 5' Aerodyne Fan, like new.
- 1—Jeffrey 6' Aerodyne Fan.
- 2—Storage Tanks, 4,000 Gallons.
- 2—Storage Tanks, 10,000 Gallons.
- 10,000 Five Gallon G.I. Cans, screw lids.
- 2,500 tons Relaying Rail, 25lb., 30lb., 40lb., 50lb., 60lb., 70lb.
- 500 MCM, 750 MCM, 1000MCM, Bare & Insulated.
- Thousands of feet of rubber covered three conductor cable. All sizes.
- 300—Transformers from 1 to 300 KVA, 110 to 13,000 primary volts.
- 400—Electric Motors, 3 to 250 H.P.
- Huge Stock of Mine Supplies.
- 600—MSA Mine Lamps, Chargers, etc.
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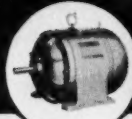


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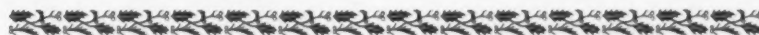
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Geneva, Switzerland M. R. Zeynel
 2 Place du Port, Telephone: 244374/75

This Jeffrey Conveyor *(Wire Rope Type)* **is VERSATILE**

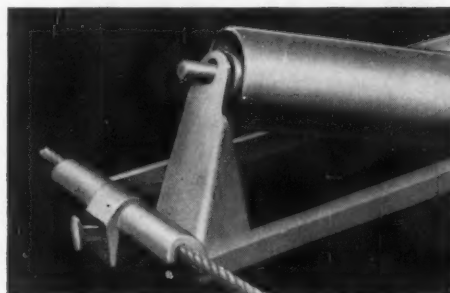
Install it above or below ground—to handle coal, salt, gypsum, ore, clay, shale, sand, gravel and other materials. You'll find it surprisingly low in first cost and easy to install. Easy to relocate, too.

Belts last longer on these Jeffrey wire rope type conveyors, because of the spring action of the flexible supports as loads pass over troughing idlers. And the Permaseal Idlers are sealed to keep out dirt; prelubricated for years of maintenance-free operation.

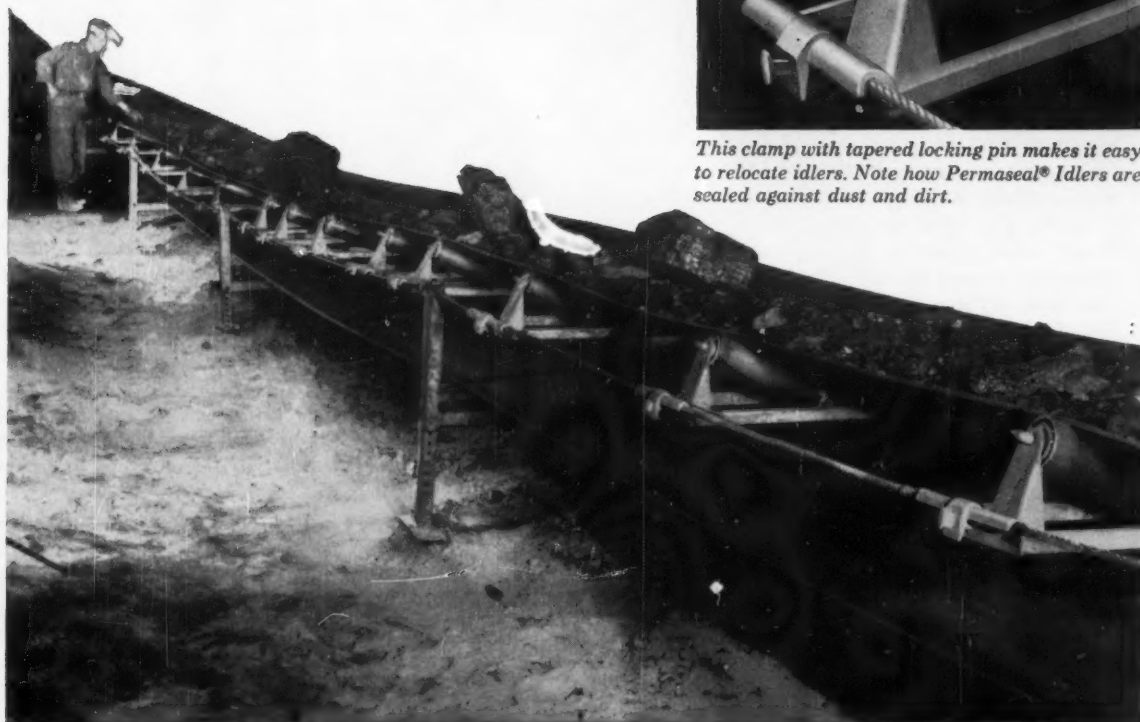
For bulletin containing detailed information on these conveyors, write The Jeffrey Manufacturing Company, 912 North Fourth Street, Columbus 16, Ohio.



CONVEYING • PROCESSING • MINING EQUIPMENT...
TRANSMISSION MACHINERY... CONTRACT MANUFACTURING



This clamp with tapered locking pin makes it easy to relocate idlers. Note how Permaseal® Idlers are sealed against dust and dirt.





This No. 12 Motor Grader smooths the way for mine output of 3,000 tons per day

Proper haul road maintenance is a basic requirement. If equipment can't get in and out easily and quickly a mine can't operate at maximum efficiency. Logical solution . . . a motor grader that does the job correctly with minimum operating cost. For example, the Cat No. 12 Motor Grader shown above is working at Island Creek Coal Company's mine at Coal Mountain, West Virginia. In an eight-hour day it covers five miles of road. In addition, this No. 12 maintains roads for two other mines in the area . . . occasionally dresses a company airport runway.

Says Maintenance Superintendent Ernest Carey, "The conditions under which the No. 12 works are rugged. A piece of equipment has to be tough to take it, and this machine fills the bill."

Now the No. 12E is even hardier than ever. The most notable improvement is the new compact engine which provides greater lugging ability in tough going, longer life and easier servicing. Horsepower remains the same . . . 115 . . . but this new engine now develops higher torque and gives the No. 12 greater load-handling capacity. Besides a new compact engine, the No. 12 Motor Grader now has the dry-type air cleaner as standard. Removing 99.8% of all dirt from intake air, this air cleaner can be serviced in five minutes . . . cuts maintenance time by as much as 70%, and substantially reduces costs, extends engine life,

Still retained are the many important features that have made the No. 12 the leader in its class. There's the oil clutch, providing up to 2,000 hours without adjustment . . . the equivalent of 12 months of operation. Ample clearance between the top edge of the blade and bottom edge of the circle provides greater rolling action . . . allows more material to move across the blade. Improved mechanical controls reduce kickback . . . make engagement easier. Blade controls have a mechanical lock. When control is in neutral, the power shaft is locked by a set of gear teeth to prevent creeping.

These are just a few of the reasons why the NEW Cat No. 12E Motor Grader is out front. For the complete picture, see your Caterpillar Dealer. Ask him to demonstrate on your job.

Caterpillar Tractor Co., General Offices, Peoria, Ill., U. S. A.

CATERPILLAR

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**THE NO. 12—
IMPROVED FOR EVEN
HIGHER PRODUCTION**

Let the master mechanic loaf. When you find him busy, it means expensive overhauls and down time. Instead, put the Amoco Mine Lubrication engineer to work. His services cost nothing and his recommendations save money. Thoroughly trained, he knows all kinds of deep and strip coal mining equipment by make and model—just which lubricants



He's relaxed...that's good!



from Amoco's complete line do the best job...give longest service...cut operating costs the most. Have him come in. Contact your nearest Amoco office, or the American Oil Co., 555 Fifth Avenue, N.Y. 17, N.Y.

**AMOCO
LUBRICANTS**
for mine machinery



coal comes clean

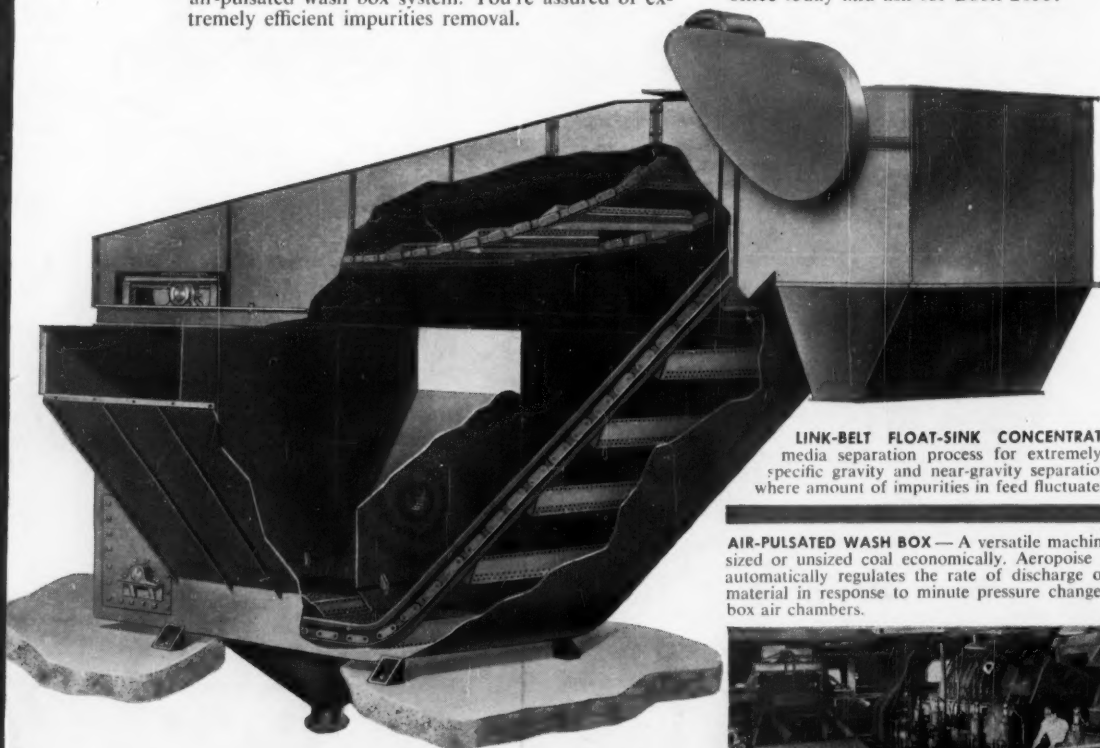
economically with Link-Belt coal washers

BTU content goes up, ash percentages down—high-quality coal comes out uniformly clean and in a highly marketable condition.

And Link-Belt gives you your choice of two approaches to coal washing—heavy-media system or air-pulsated wash box system. You're assured of extremely efficient impurities removal.

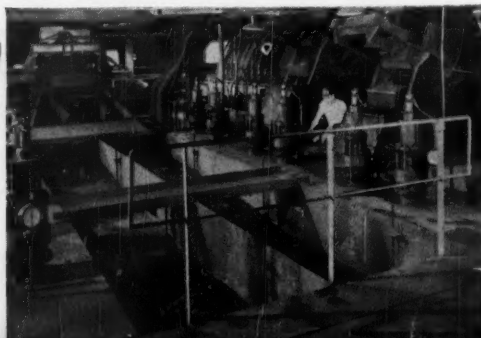
For high capacity cleaning of sized and unsized coal, or for high- and low-gravity separation, Link-Belt systems will meet your requirements economically. Our specialists will work with your engineers to choose the exact equipment. Call your Link-Belt office today and ask for Book 2655.

15,380



LINK-BELT FLOAT-SINK CONCENTRATOR—Heavy-media separation process for extremely high or low specific gravity and near-gravity separation, or for jobs where amount of impurities in feed fluctuates.

AIR-PULSATED WASH BOX—A versatile machine for cleaning sized or unsized coal economically. Aeropoise refuse control automatically regulates the rate of discharge of high-gravity material in response to minute pressure changes in the wash box air chambers.



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